Organic Gardening

GARDENING AND FARMING WITHOUT COMMERCIAL FERTILIZERS

June 1949

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- Editor and Publisher
  J. I. RODALE

Managing Editor
DR. WILLIAM H. EYSTER

Art Director
KARL MANAHAN

Advertising Manager
VERNICE KEMMERER

Staff Photographer
ROBERT RODALE

ORGANIC CULTURE

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LEAVES, WORMS — HUMUS

Gentlemen:

Last spring I had a lot of oak leaves so I put them under some trees in the shade. I, or rather my wife, hoed a lot of weeds so I gathered weeds and quite a little ground with them and put them all on the leaves. I really forgot all about the leaves until this Fall as I started to make my compost pile.

I went to look for my leaves and I had the biggest surprise I ever had in my life. Well, I could see no more leaves so I took my shovel and started to dig. Every shovel was so full of worms. I never saw so many earthworms in all my life and healthy looking, like young snakes. Not a sign of a leaf or weed was left. I put all this nice black humus or castings I guess I should say, around my fruit trees so I hope by the fruiting season I get some results.

Last year we made our first compost pile and our tomatoes were the best I ever ate. Most tomatoes ran quite large—1½ lbs. and 1⅛ lbs. We had very few small ones. My wife canned 100 quarts of whole tomatoes (cold pack). Now we liquify them and you

(*Continued on Page 8*)

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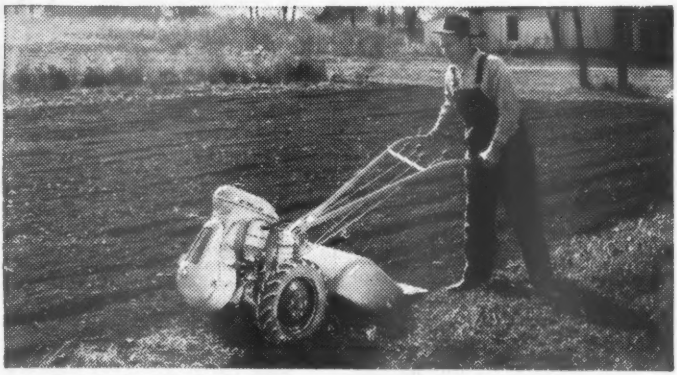

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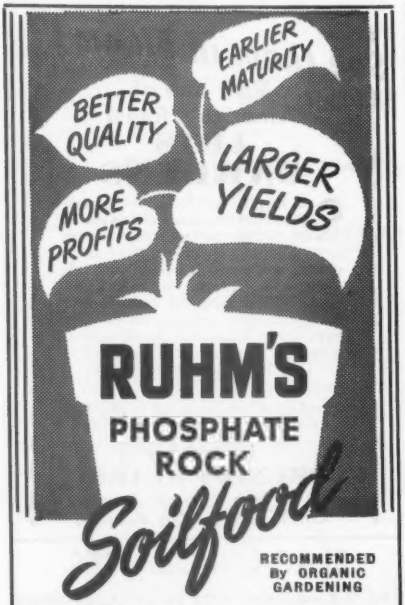

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(*Continued on Page* 10)

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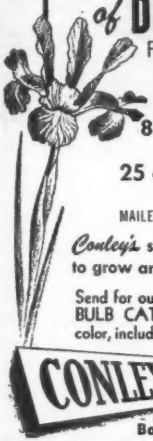

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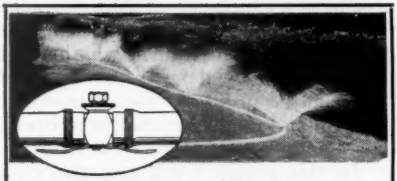

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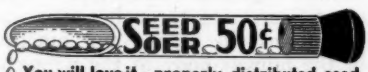

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CANCER—PART II

LAST month I introduced the subject of whether cancer is related to the use of artificial fertilizers in the production of our food. It was merely an introduction and in great part gave the views of the late Frederick L. Hoffman, M. D. of the Prudential Insurance Company of America who held that diet is an important element in cancer and questioned whether the use of commercial fertilizers does not react injuriously on the human organism and might be a factor in bringing about cancer.

In this article I will cite the work and statements of other physicians who are suspicious of the use of commercial fertilizers. Dr. Max Gerson of New York City, a cancer specialist who seems to be curing some cancer cases by a special diet, had this to say at a hearing in Washington relating to Bill No. S. 1875 held on July 1, 2 and 3, 1946, to authorize the Government to sponsor cancer research, which was not passed:

"The fundamental damage starts with the use of artificial fertilizer for vegetables and fruits as well as for fodder. Thus the chemically transformed vegetarian and meat nourishment, increasing through generations, transforms the organs and functions of the human body in the wrong direction.

"Another basic defect lies in the waste of excrements of the cities. Instead of returning the natural manure to the fruit-bearing soil, it is led into the rivers, killing underwater life. The natural cycle is interrupted and mankind has to suffer dearly for the violation. Life in forest and wilderness should teach us the lesson.

"But we can regain the lost defense and healing power if we return as close as possible to the laws of nature as they are created."

Dr. George Miley of the Gotham Hospital, New York City, who worked with Dr. Gerson on some of these cases, testified at the hearing as follows:

"We do know experimentally that diet definitely does influence cancer. There is a lot of experimental work done, very good work done to substantiate that..... It is reasonable to assume that the closer one's diet is to nature and the soil, with fresh fruit from the trees and fresh vegetables directly from the garden, the nearer one is to normal health."

I want to quote also the New York Times of December, 1940. I do not have the record of the particular day. It said:

"According to Dr. Alexander Brunschwig of the University of Chicago, in the current national bulletin of the American Society for the Control of Cancer, there is experimental evidence to suggest that in animals, at least, inadequate diets may serve as adjuvants to the action of certain cancer-producing compounds.

"An illustration of this point is the recent work of Kinosita, the Japanese

pathologist, working at the Memorial Hospital, New York, who has shown that when rats are fed an adequate, well-balanced diet, the ingestion of cancer-producing substance known as 'butter yellow' is innocuous. However, when the rats are maintained upon an inadequate diet, especially lacking in vitamins, the ingestion of this chemical causes inflammatory changes in the liver followed by cancer of this organ.

"Such expeirments, if they can at all apply to man" states Dr. Brunschwig, "would suggest that while an adequate, well balanced diet does not in any way insure against the development of cancer, it does contribute to the maintenance of a general normal body economy and in this way might tend to obviate the progress of other diseases or pathologic conditions which might themselves favor the development of cancer.

"It is perhaps not too far-fetched to state that when a better understanding of the mechanism of cancer development in man is obtained, the factor of diet may assume greater importance in attempts at prophylaxis (prevention) and control of the disease than can now, in our present state of knowledge be the case."

When the Nazis marched into Austria they drove out one of the world's greatest cancer authorities—Dr. Ernst Freund. Dr. Freund's researches—carried on for years—are based on the theory that "cancer is caused, not by infection or irritation, but by false digestive processes." Frederick Pearson, an American millionaire, once saw a friend die in agony from cancer. He was profoundly shocked by the sight, and swore he would spend his last cent if necessary to see cancer wiped out. Frederick Pearson is apparently as good as his word, for he founded a research institute in Vienna, placing Dr. Freund in charge. When the Nazis turned Dr. Freund out, Pearson had the costly equipment as well as Dr. Freund transported to London.

Take the case of Dr. John R. Davidson, of Winnipeg, Manitoba, who during his entire professional life, and he is now over 75, specialized in cancer work. Let me quote Dyson Carter, who wrote in "Saturady Night", a newspaper published in Toronto:

"The story is straightforward. We take it up at the time when Dr. Davidson abandoned his practice and professorship to give all his energies to research. That was twelve years ago. Davidson was convinced then that cancer was caused by changes within the body resulting from improper eating. 'Cancer is a nutritional deficiency disease,' he declared.

"This conclusion was derived from experiments on mice. Davidson found that the regular experimental forms of cancer could be produced easier in mice that had been raised on food lacking in vitamins. The opposite was also true. Mice fed special vitamin-rich diets were very resistant to cancer. Furthermore, after generations of mice were raised on vitamin-deficient diets, the offspring became more and more liable to cancer. In this Dr. Davidson believed that he had a clue to the puzzling fact that there are "cancer susceptible" families, although the disease is definitely not hereditary.

"Linking the Davidson research with the virus theory, it could be said that the cancer virus, existing in bodies, passes over to the active, virulent form under certain definite chemical conditions brought about by prolonged lack of sufficient vitamins.

"Dr. Davidson was able to produce mice families susceptible to cancer. In five generations, by feeding with "excess" vitamins and minerals, he bred from those susceptible mice a new generation quite free from any abnormal tendency towards cancer. This type of evidence—the reversible demonstration—is among the most powerful that can be provided by experimental science.

"What are the vitamins used in the Davidson research? Mainly those associated with chicken embryos and with wheat germ. Why? Because the doctor's work convinced him that the

disease of cancer is related in some way to normal cell multiplication that takes place so rapidly in developing embryos, such as that of the fertilized hen's egg. Here again there is nothing that is scientifically unsound.

"But it is from his clinical work that Dr. Davidson has collected most convincing evidence. He has stopped human cancer from spreading. He has completely cured some cases. A child suffering from lymphosarcoma and given only a few months to live was gradually restored to health without surgery or radium. After three years the affected glands were cured and normal.

"In this case the treatment consisted of special feeding. The Davidson diet is adjusted to individual patients, but in general includes large amounts of fresh vegetable juice (carrot and lettuce), raw vegetables, (carrots, spinach, lettuce, peas, beans), wheat germ and rare beef. In addition, the patient gets massive doses of vitamins in the form of cod liver oil, wheat germ oil, and brewers' yeast. Finally, there is a preparation made from chick embryos."

Dr. J. Ernest Ayre and Dr. W. A. G. Bould, of the Royal Victoria Hospital and McGill University, in April 1946 announced that they had discovered many cases of cancer that were due to vitamin deficiencies in the diet. They stated that there is "excellent circumstantial evidence to suggest that the nutritional deficiency may have been a primary factor leading to the malignancy."

Dr. Arthur L. Wallace, a practicing physician for 45 years in Nashua, New Hampshire, appeared before the State Agricultural Advisory Board at Concord, New Hampshire on August 31, 1947 and said "that if foodstuffs contained more nutrition, people would not be so susceptible to diseases such as cancer, heart ailments and other organic disorders. There appears to me to be too much seeking after disease carrying germs these days, and then search for wonder drugs to kill them off. It would be more beneficial if we corrected the nutritional deficiencies of the earth, and made people so healthy that they would not be susceptible to these same germs." He stated that "nutritional deficiency in the soil is the chief cause of increased diseases among people."

Sir Arbuthnot Lane, a famous English surgeon, has said: "Long surgical experience has proved to me conclusively that there is something radically and fundamentally wrong with the civilized mode of life, and I believe that unless the present dietetic and health customs of the white nations are reorganized social decay and race deterioration are inevitable."

I was amazed to read that the late Dr. Alexis Carrel in his classic "Man the Unknown" was aware of the dangers of using artificial fertilizers. In this book he said: "Man is literally made from the dust of the earth. For this reason his physiological and mental activities are profoundly influenced by the geological constitution of the country where he lives, by the nature of the animals and plants on which he generally feeds. His structure and his functions depend also on the selections he makes of certain elements among the vegetal and animal foods at his disposal. The chiefs always had a diet quite different from that of their slaves. Those who fought, commanded, and conquered used chiefly meats and fermented drinks, whereas the peaceful, the weak, and the submissive were satisfied with milk, vegetables, fruits and cereals. Our aptitudes and our destiny come, in some measure, from the nature of the chemical substances that construct our tissues. It seems as though human beings, like animals, could be artificially given certain bodily and mental characteristics if subjected from childhood to appropriate diets."

Carrel also remarks: "It (the organism) is also affected by the deficiencies of the essential physiological and mental functions. The staple foods may not contain the same nutritive substances as in former times.

Mass production has modified the composition of wheat, eggs, milk, fruit, and butter, although these articles have retained their familiar appearance. Chemical fertilizers, by increasing the abundance of the crops without replacing all the exhausted elements of the soil, have indirectly contributed to change the nutritive value of cereal grains and of vegetables. Hens have been compelled by artificial diet and mode of living, to enter the ranks of mass producers. Has not the quality of their eggs been modified? The same question may be asked about milk, because cows are now confined to the stable all the year round, and are fed on manufactured provender. Hygienists have not paid sufficient attention to the genesis of diseases. Their studies of conditions of life and diet, and of their effects on the physiological and mental state of modern man, are superficial, incomplete, and of too short duration . . ."

Dr. Carrel was also aware of the danger in placing too much confidence in the mortality statistics as a means of our health. In this regard he said: "All diseases of bacterial origin have decreased in a striking manner . . . . But we still must die in a much larger proportion from degenerative diseases. In spite of the triumphs of medical science, the problem of disease is far from solved. Modern man is delicate, 1,100,000 persons have to attend the medical needs of 120,000,000 other persons. Every year, of this population in the United States, there are about 100,000,000 illnesses, serious or slight. In the hospitals, 700,000 beds are occupied every day of the year . . . Medical care under all its forms, costs about $3,500,000,000 yearly . . . . The organism seems to have become more susceptible to degenerative diseases."

Now comes another physician of high standing, Dr. James Asa Shield, who at a convention on November 8 at Miami, Florida, of the Southern Medical Association attacked the use of chemical fertilizers in no uncertain terms. Let us quote from the Associated Press dispatch which was sent across the wires of the country and which was printed in dozens of newspapers: "Dr. James Asa Shield, assistant professor of neuro-psychiatry of the Medical College of Virginia, said in an address before the Southern Medical Association convention here today that food produced from soil fertilized with chemicals has caused an increase of degenerative diseases throughout the United States.

"Shield charged that agriculture's attempt to correct soil exhaustion with chemicals has not been successful.

" 'The doctor must demand that the agriculturist produce a food that will meet the multiple cell needs for best growth, development and function,' he said.

"Dr. Shield said one degenerative disease, multiple sclerosis—is virtually unknown in the Orient, where natural manures and plant refuse are used as fertilizers.

"He said the death rate from the disease in the United States is almost as high as the infantile paralysis death rate.

"Inorganic chemical fertilizers 'at times disturb the chemical balance of the soil and in turn affect the health of the animals that feed on the crops,' the doctor reported.

"Despite deficiencies in vitamins, proteins and fats in the Chinese diet, they have no sclerosis of their nerves, their blood vessels, blockage of their veins of hypertension, he said.

"He said several European countries that use chemical fertilizers have a high incidence of sclerosis and other degenerative diseases.

" 'The incomplete fertilization program carried on in Europe and the United States is contributing largely to the inadequacy of the quality of the diet, with deficiency of minor minerals and unknown factors of this diet contributing and being largely responsible for the presence of multiple scelrosis.' "

Lou Gehrig, the famous baseball player who died of multiple sclerosis, perhaps could have been well and making millions of baseball fans happy

today if artificial fertilizers had never been brought into use. The Governor of Arizona recently died of this disease. Dr. Shield is an acknowledged authority in his field and for that reason was called upon to address over a thousand doctors at this meeting.

One of the greatest nutritionists of our time, Dr. E. V. McCollum of John Hopkins University recently said: "When it comes to getting out of the soil and into the plant, elements which may be there already but which the plant cannot now secure, the advocates of what is called the 'organic school of soil improvement' have a good many persuasive arguments to present for their side of the case. Organic ferment may well stir up and release trace elements and other elements which commercial fertilizers alone can never provide." This quotation was given in a recent publication of *The Land* magazine.

The American Journal of Digestive Diseases, in its June, 1948 issue, referring to a book by N. Philip Norman, M. D., and James Rorty, called *Tomorrow's Food,* said:

"A careful study of the English authors who recommended natural compost for fertilizing purposes, particularly McCarrison and Howard, and of the experimental work of Maynard, Albrecht, Brody and others in this country, leaves one convinced of several facts. One fact is that until proper soil fertilization is practiced, we shall not be able to obtain from food (nor from artificial vitamins) the strongest known impetus to health. A second fact is that where "pedigreed" food products have been eaten under proper conditions of cooking, a most *amazing* degree of health has been obtained both clinically and in experimental animals. It is not too much to say that such nutrition has been proved capable of *banishing disease of all kinds and of conferring a vigorous old age.* As Minot has recently indicated, the most important research today is nutritional research. Nobody knows the breadth, depth or extent of the benefits in store for mankind as a result of the patient, laborious efforts of our nutritional experts."

The American Journal of Digestive Diseases says further:

"Norman undoubtedly believes that "proper" nutrition is capable of conferring upon an individual or a group, in due time, a superlative degree of fitness capable of relative immunity to infections and to the terrible degenerative changes so common now among older persons..... I think the best efforts of us all should be dedicated to what Norman has in mind. There are countless hurdles in the path. Vested interests will fold up only on public demand. Education alone can create a suitable public reaction. The *ideal of perfect nutrition* is the most dynamic concept before the profession today."

Dr. Norman is consulting nutritionist for the New York City Departments of Health and hospitals.

I have to stop somewhere with these quotations from the thoughts of physicians. There are available dozens more. They show clearly that many physicians believe that there is some connection between the use of artificial fertilizers and the increasing incidence of cancer. Yet when one springs this concept upon a doctor who has not studied the subject he thinks you are crazy to think such a thing. Doctors must be made to think along the lines of good health coming from a soil rich in humus. They must set up experimental projects in which cancer cases in the early stages are fed on an exclusive diet of foods raised organically. In this respect I wish to state that the diets and foods given to patients in hospitals generally are atrocious—white breads, white sugars, canned foods.

Every hospital should bake its own whole-wheat bread, the wheat of which should be ground daily so as to preserve all the elements in the wheat seed until the last moment. There must arise special hospitals surrounded by their own farms which produce their own foods. In Canada there is one such hospital, an institu-

tion for the cure of mental cases. The Medical Superintendent of this hospital is Dr. F. H. E. Baugh who enjoys a wide reputation as an authority on mental hygiene. Two farms totaling 400 acres are being conditioned by organic practices for the growing of the foods to be used in the Sanitarium. Dr. Baugh and his staff believe that organically grown foods rich in the essential vitamins and elements will greatly expedite the healing of sick minds. The building of the soil and the growing of the organic foods is under the supervision of J. D. Kennedy, Bursar and Secretary of the Sanitarium who is keenly interested in the relation between soil and health.

Mr. Bernard M. Baruch, of 597 Madison Avenue, New York, New York, will you finance the organization of one such hospital? You have done great things; you have given much money. Here is a glorious opportunity to pioneer in a field that is crying for badly needed investigation.

(To Be Continued)

The War We Wage on Insect Pests

By DR. EHRENFRIED PFEIFFER

NEW insecticides spring up on every hand nowadays, in manifold variety and combination of chemicals. Yet the hosts of insect pests also increase and wax fat and tough. The damage inflicted upon America's crops in 1948 was estimated by the Department of Agriculture at four billion dollars. No wonder it seems necessary to take steps. More and more poisonous chemicals are sprayed out in increasing amounts. Two recent observations have cast a shadow of doubt over this geometric progression. One was the discovery that insects are able to adjust themselves to a poison. From survivors resistant strains spring up and another stronger poison is needed, but then the cycle repeats itself. The second observation is that insecticides are hazardous not only to harmful insects but also to beneficial ones and, in general, to those who consume the crops thus treated.

DDT

DDT was appraised as a universal and successful fly, mosquito and other bug killer. Then an experimental station in Florida announced that it could breed a DDT resistant fly. This experiment station in Orlando reports that "the DDT resistant insects were tough, darker, larger and more active than the usual susceptible fly." What the experiment station can do Nature can do too. The agricultural extension service of Los Angeles County, California, reports that the common house fly can no longer be effectively combatted with DDT. Nature's strain was even 200 times more resistant to DDT than was the laboratory strain. As to the health hazard: DDT is very persistent and has a particular affinity to fat. It is absorbed in fatty substances and migrates from sprayed crops into the fatty part of the animal body, especially into the fatty sub-

stances of the nervous system. There it is accumulated. In cows, it can be found in the butterfat of the milk, in steers and hogs, in the body fats, if they eat DDT sprayed feed. (It is with regret that I write these lines, for I enjoyed the flyless DDT years of 1946 and 1947 in our barn and kitchen. Last fall we, too, observed an increase of flies.)

Other Highly Toxic Insecticides

Now it shall be Chlordane or one of those compounds with an exotic name like 1, 2, 3, 4, 10, 10,—hexachloro—1:4, 5:8—diendo-methano—1, 4, 4a, 5, 8, 8a—hexahydro-naphthalene. (I hope the typesetter forgives me, that is really and truly the name.)

Dr. James R. Wilson of Chicago, secretary of the Council on Foods and Nutrition of the American Medical Association, warns in the N. Y. State Journal of Medicine of March 1st, 1949, that poisons remaining in foods for the table are a public health hazard. Fresh fruits and vegetables are considered by him to be dangerous. The manufacturers of baby foods already refuse to accept fruit and vegetables which contain spray residues. BHC—benzene hexachloride and parathion, two of the newer more powerful insecticides, penetrate the surface of plants and are incorporated in the tissues. These cannot be removed by washing and peeling. "Disastrous consequences seem a certainty unless the use of the new pesticides is surrounded by better safeguards than now exist ...Concerning their toxicity to man, there is a shocking lack of factual data having to do with the effect of these substances when incorporated in foods and eaten. Little of practical value is known of how human beings withstand small amounts over long periods of time", Dr. Wilson concludes.

Relative Values of Insecticides

The experimental stations and workers of the Department of Agriculture do painstaking work to demonstrate the relative values of insect killers. The fruit and vegetable grower then picks out the one which is most highly recommended from the point of view of its effectiveness. He does not read medical journals. Nor is he familiar with the doubts which may be roused by reading the research by the objective, outstanding authority of the U. S. Food and Drug Administration. Arnold J. Lehman, M. D., Chief of the Division of Pharmacology, published an important paper in the Quarterly Bulletin, Vol. XII, No. 3, July 1948, of the Association of the Food and Drug Officials of the U. S. (reprinted in Bio-Dynamics, Vol. VI, No. 7.) He reports that organic phosphate compounds, nicotine, lethanes and thanite belong to the most poisonous, exceeded only by chlorinated camphenes, gamma isomes of benzene-hexachloride and chlordane. (Trade names: DDT, TEP, Parathione, HETP, ABH, Lethane 384 Special, Lethane 60, thanite, DBH.) Only pyrethrum, rotenone, derris, Npropylisome and piperonyl butoxide are relatively or entirely harmless. With the exception of parathione and nicotine, all the dangerous compounds are more dangerous when in solution than when in the form of wettable powder or dust. Some like nicotine, chlorinated camphene (alas not in high dilutions), GBH, Lethane, Chlordane, Thanite, Heptachlor, are skin irritants and thus announce danger. The organic phosphates, unfortunately, do not give this immediate warning. Some are cumulative poisons, by frequent use even the most minute quantities gradually build up to the toxic level. A single dose of beta isomer of benzene hexachloride does not kill a rat. When chronically fed in concentrations of 10 ppm it produces poisoning. A chronic toxicity has been observed in dogs in most cases. Predominant injuries in test animals were: liver necrosis or damage, enterocolitis and gall bladder necrosis, kidney damage, adrenal cortex damage.

Care Must Be Exercised

It is evident that we must exercise care in combatting insect pests. Except for such standbys as rotenone, pyrethrum, derris, and to a certain

extent nicotine (Black Leaf 40) let us hold back on the use of insecticides until they are proven to be harmless. The writer made experiments years ago, demonstrating that even the last named products kill earthworms on contact but have no lasting effect. In the same soil new earthworms developed; the effect lasted for only a few days, then the spray had decomposed. Lead, arsenic and copper in excess have a residual effect which can be counteracted to a certain extent through humus and leaf mold. Apparently the metallic poisons are fixed to organic matter and only slowly released below the toxic level.

Grower Responsible For Pests

It must be admitted that insect pests have gotten the upper hand. But the grower alone is to blame. His intensive, so-called modern methods of agriculture have fostered the rapid spread of insect pests. The grower has sinned against nature's laws of balance and now harvests the results of his omissions. However, a mistake cannot and should not be combatted by committing greater errors. The introduction of monocultures, growing one particular kind of crop over large areas and of continuously repeating the same crop, with no proper rotation, has given the insect THE chance of a lifetime to develop in abundance. In a mixed culture and when the same crop does not return more than once in four or five years to the same field, lies one of the main safeguards against the excessive development of damaging insects.

One hundred acres of apple or citrus trees or 20 acres of celery or onions give a better chance for the rapid development and spread of insect pests than one acre in a mixed culture alternating with other crops. Insects are extremely specialized in their habits and adaptation; here lies their weakness. It is said, of course, that diversified and mixed cultures are not profitable, that expensive implements pay only if used over large areas. But how much time and money do we spend in spraying and spraying equipment? This is quite apart from the costly health hazards involved. The argument is used that very few laborers in orchards and intensive vegetable truck areas are killed by sprays. This we answer by the statement that very few of the chemical factory workers who produce the sprays get poisoned and very few of those who produce poison gases and dynamite. The explosive industry has one of the lowest accident rates. And yet explosives have killed thousands of other people.

Biological Control

It is admitted that the biological approach to the insect problem does not provide a complete solution as yet. However, the re-establishment of a natural balance, including all other means of achieving a healthy situation, the protection of birds, the introduction and fostering of natural enemies of damaging insects, a humus content of not less than 2 to 3%, crop rotation, mixed cultures, alternating rows of different species, is a fundamental condition. In fruit tree culture in recent years, again for economic reasons, the fast growing and early bearing varieties have been preferred. Organisms which grow too fast, we know this from human beings, are the easy prey of disease and weakness. The relationship between root stock and graft must be investigated and resistant strains must be selected and propagated. Many a split bark (the nesting place for trouble) and cankerous growth is due to the fact that the root stock pushes forward too much, with too great an osmotic pressure and the overfed tree grows faster than it should. The opposite relationship also exists, with a too slow growing root stock underfeeding the quick growth tendency of the graft. Both are cases of malnutrition aggravated by unbalanced soils low in organic matter content. The spray gun does not cure any of these or get at the causes of any other physiological disturbance.

We stand in an intermediate phase right now. On the one hand, there are

orchards and vegetable cultures, whose healthy balance is disturbed. Here biological and organic principles can only be applied to a limited extent. The basic disturbance cannot be rectified and a compromise has to be reached. The harmless sprays, as listed, may be used. The introduction of organic methods, of composting can help to introduce a better balance. On the other hand, the one who starts a new growth could begin at once with a properly balanced system. The writer does not claim that with organic methods there will be no more damaging insects. But he does claim that in a well balanced system plants will be more resistant and pests will not spread out. He has been farming and gardening on a large commercial scale since 1926. His observation has been that the harmful bugs can always be found but that they did no appreciable damage and, in particular, did not spread. During this period he has never used any lead, arsenic, or copper sprays nor any of the newer insecticides, except in recent years in very small amounts he has used rotenone and pyrethrum in a few cases, but not as a general procedure. He has not used any commercial fertilizer but composted manure and compost. He has followed the bio-dynamic system because he experienced its superiority. But ordinary composting is good too. His experience has been that he could grow over a ten year period in greenhouses covering 2 acres, tomatoes, vegetables, and grapes, without any chemical sprays and without insect pests. The soil in these greenhouses was not removed and renewed. He had, however, the advantage that there were no commercial growers nearby, thus eliminating the possibility of re-infection from the neighborhood. This factor is quite a handicap for the organic gardener, he usually sits right in the midst of a diseased area.

Natural Philosophy Important

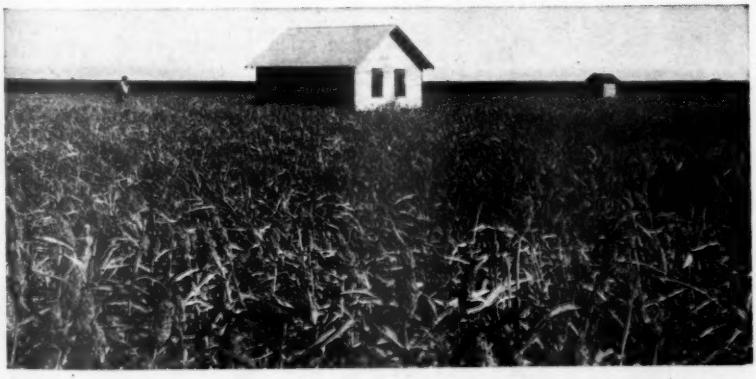
There are many so-called superstitious customs about which the scientist smiles. However, these have often proven their worth in practice and now one gradually begins to understand their mechanism. Old Scotch people advise putting a handful of oats in the planting hole of a tree. Why? These oats will swell, germinate, create growth hormones which will be released and absorbed by the roots of the tree. Farmers in the old world used to "paint" their trees with a paste of cow dung and clay. The thick cover protects the bark, the cambium underneath is stimulated, the circulation of sap in the tree is increased and better nourishment of the leaves is effected. Mulching of trees is natural. In the woods, the natural leaf fall produces an ideal humus. (But even there we see diseases and pests, particularly with monoculture, and if selective cutting is not practiced.) A tree which is forced to production is weakened, then disease sets in. The same principle is applicable to any agricultural crop. In technics we know that each material has a load limit, beyond which it will break. There is a load limit for growth, production and reproduction too, a biological threshold. Once this threshold is passed disease will be the natural reaction. It is because modern agriculture and horticulture have not observed the organic laws that we suffer from all the described disturbances. The introduction of a thorough biological knowledge and philosophy is, therefore, the first condition for sucessful research and later on for efficient practices to combat insect pests without health hazards. We are still a long way from reaching this goal. Expressed in dollars and cents, however, the cost of one or two days of World War II, or one tenth the cost of atomic research, or even the cost of developing poisonous insecticides, would more than pay for proper organic research. The cost of spraying and apparatus to the grower could not be equalled by the expense entailed in following the proper organic method, this last must inevitably be less.

SOIL CONSERVATION

Soil Conservation Service, U. S. Dept. of Agriculture

BEFORE

An uncontrolled erosion has made living impossible. Successive wheat failures since 1932. The house has been vacated for over two years. No vegetation. Thousands of tons of sand drift over this section, as can be seen in the foreground. This is a good example of wind erosion.



Soil Conservation Service, U. S. Dept. of Agriculture

AFTER

The sand waste shown in the illustration above has been stabilized by growing suitable cover crops. The sand hummocks were leveled in August, 1936 and the field was sown in wheat. The wheat was blown out. The field was planted in milo as a cover crop in July 1937 with the results shown in the photograph.

M L P Fertilizer

By WILLIAM H. EYSTER, Ph. D.

THE NPK method of fertilizing the soil has, until recently, almost completely dominated the thinking of most of our farmers and gardeners. This method consists in applying to the soil artificially-prepared, highly-soluble compounds containing nitrogen, phosphorus, potash and elements or ions which tend to accumulate in the soil in toxic amounts, as sodium and sulphuric acid. Some soil chemists claim that two-thirds of the water-soluble compounds of nitrogen, phosphorus, and potash may be lost to the soil by being dissolved in soil water and leached out of the soil, by being dissolved in soil water and then precipitated in lower soil layers as hardpan, or by being dissolved in the soil water and then reacting with iron and aluminum compounds in the soil and becoming fixed in forms relatively unavailable to growing plants. The highly soluble compounds may form the ions including nitrogen, phosphorus, and potassium in such excesses that the plants will absorb far too many of them for the well-balanced nutrition of the plants.

Bacteriologists have found that small quantities of the carbonates, chlorides, sulphates, and nitrates of sodium, calcium, and magnesium greatly increase the beneficial bacterial activities of many soils. The increased bacterial activity may liberate more phosphorus and potassium for the plant. These soluble compounds, however, usually are only stimulants, and if the landowner continues to apply them year after year, the stimulating effects will disappear and the soil will be found to have been depleted. The depletion consists largely in the "burning out" of the organic matter or humus, the accumulation of toxic ions in the soil, and the formation of hardpans.

The M L P Method

The University of Illinois established the Morrow Fertilizer Plots in

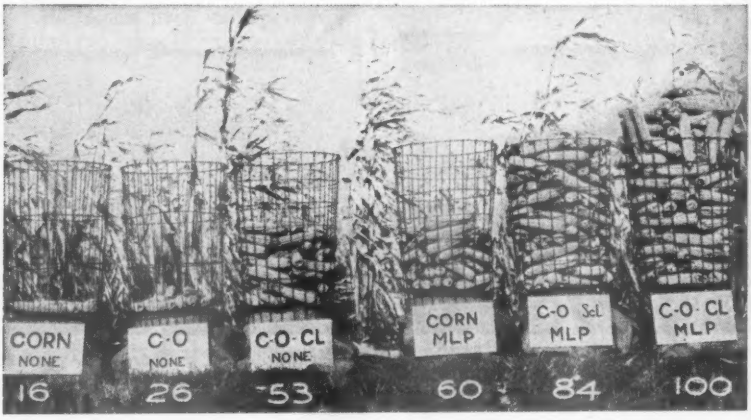


FIG. 1 *The baskets and figures represent the corn yield on famous Morrow plots after 67years of cropping. The C, O and Cl stand for corn, oats and clover and indicate the rotation followed. The M, L and P stand for manure, limestone and ground rock phosphate and indicate the soil treatment. This is the oldest soil experiment field in America and the oldest continuous corn plot in the world.*

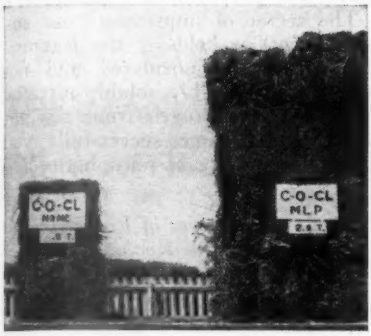


FIGURE 2

These two piles of bales represent the yields of clover hay on the Morrow plots after 67 years of cropping. The smaller pile is the clover from the untreated land. The larger pile is the clover from the land that was treated with applications of manure, limestone and ground rock phosphate.

1876, just a century after the Declaration of Independence. These plots demonstrate different farming practices on the rich Illinois soil which some people believed would "never wear out." The plots were planned to compare three different cropping systems, with and without soil treatment. One plot has been planted with corn continuously year after year. Another has been rotated between corn and oats. A third has been rotated from corn to oats to clover. Half of each of these plots has received soil treatment, while the other half has received no soil treatment of any kind.

After 67 years that part of the field farmed continually in corn yields only 16 bushels per acre! That part of the field rotated between corn and oats makes a 26 bushel per acre corn crop. That part rotated from corn to oats to clover makes 53 bushels per acre. The first two plots grew soil-depleting crops while the third grew two soil-depleting crops and one soil-building crop. The results prove that corn depletes the soil more rapidly than oats.

Now let us see what happens when we combine crop rotation with the application of manure, lime and phosphate rock which has been referred to as the M L P method of fertilization. In the three-crop-rotation the yield is 53 bushels of corn without fertilization and 100 bushels per acre when manure, lime and phosphate rock are added to the soil. These yield differences are shown in Fig. 1, page 22. It should be remembered that this is the oldest soil experiment field in America and the oldest continuous corn plot in the world.

The increase in yield of the fertilized plots is even more striking in the clover crop. The untreated part of the plot produced only 0.9 tons of clover hay per acre as against 2.9 tons for the treated plot. This difference is shown graphically in Fig. 2.

Oats on the untreated part of the plot yield 53 bushels per acre as compared with 72 bushels on the treated part.

In these experiments only as much manure was used as would be recovered from feeding the crops grown on this field. Enough limestone has been added to keep the soil sweet for

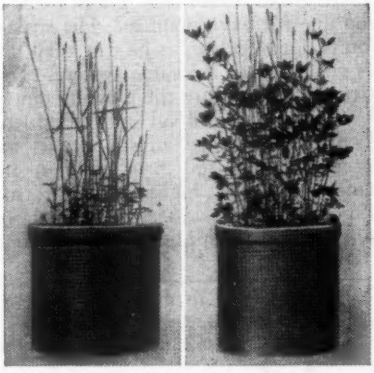


FIGURE 3

The difference in these two pots of spring wheat and sweet clover at the University of Illinois is only that the pot with the thrifty clover got ground rock phosphate. Amount applied was equivalent to 1,000 *lbs. per acre. Roots of legumes are especially active in dissolving and absorbing the phosphorus from ground rock phosphate. The increased legume growth supplies nitrogen and organic matter, improving the soil both chemically and physically for crops that follow.*

clover; the last application was in 1919. Enough ground rock phosphate has been applied to keep the soil testing "high" in available phosphorus; the last application was in 1925.

Yields have been nearly doubled by using only low-cost ground rock phosphate, low-cost ground limestone, and the manure that could be produced by feeding the crop.

Self Feeders

Farmers have long been using self feeders in producing poultry, hogs and cattle. It is even more important for him to set up a "self feeder" system in his soil practices. Instead of fertilizing each crop with an expensive, highly-soluble artificial fertilizer, the soil was enriched in these experiments with generous applications of low-cost natural minerals so that it acts as a "self feeder" for all crops for years ahead. Why not adopt this system which is simple, inexpensive, and builds up rather than tears down the soil? With this system, crop yields have not decreased but increased year after year.

But what about the grain farmer who doesn't have manure? His situation is not hopeless, as he can keep up his ground with the same system, substituting for manure the plowing down of cover crops and all crop residues. If any element becomes deficient as determined by soil tests, add it in some natural, not highly soluble form. If potash, for instance, is needed, it can easily be supplied by spreading pulverized potash rock (galuconite).

The secret of improving your soil at low cost is held by the legumes. When properly inoculated and not supplied with highly soluble nitrates, they feed on nitrogen from the air. But to grow legumes successfully, you must have plenty of phosphorus and lime.

Some Advantages of Pulverized Natural Rocks

These natural products are relatively low in cost as compared with the artificially prepared commercial fertilizers. They do not corrode bags or machinery. They include many of the "trace" elements that may be of value to crops in some localities. Although pulverized rocks are insoluble they become soluble in the soil when acted upon by the natural soil and root acids. Numerous field experiments conducted over long periods of time prove that the phosphorus, for instance, applied in the form of ground rock phosphate remains in a form available to plants. Because of the "residual effect" of pulverized rocks, putting them on your land is like putting money in the bank.

Rock powders can be spread in the least expensive way and they need not be applied every time you plant a new crop. They can be spread with a lime drill or broadcast over the soil preferably after plowing and before harrowing and disking. You can apply enough in one application to last ten or more years.

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ORGANIC GARDENING EMMAUS, PA.

THE MANURIAL VALUE OF WATER HYACINTH

By DR. PAUL SCOT

WATER hyacinth (*Eichhornia crassipes*) grows with such profusion in the streams of the South that we should inquire into their value for building up depleted soils. This plant has been considered a serious menace to agriculture, fisheries, sanitation, and health in the South and other parts of the world where it grows with remarkable rankness. It has become such a menace to the sanitation and health of rural Bengal, for instance, that the Bengal Department of Agriculture suggested the possibility of utilizing the plant as a source of manure to meet, to some extent, the deficiency of nitrogen in the soils of India and Pakistan. With a view to obtaining information regarding the course of decomposition of water hyacinth in compost and soil, A. Karim of Dacca University undertook an investigation of the microbiological decomposition of water hyacinth and reported his results in the December, 1948 issue of the Soil Science.

The plant material used in Mr. Karim's investigation was collected from a local field and dried in the sun and then reduced to a fine powder. Ten gram portions of this leaf powder were put in culture flasks containing a full nutrient culture solution. There was an abundant growth of fungus in all the aerobic flasks during the early period of decomposition. Bacteria were found to take a much less active part in the decomposition of the water hyacinths.

Since water hyacinth composted under controlled conditions was found to give a product of high manurial efficiency, the next step was to investigate its decomposition in the soil and to determine its effect on the nitrogen contents and microbial population of the soil. Two soils, one acid from Dacca farm (pH 5.4) and the other alkaline from Faridpur (pH 8.35) were used in the controlled experiments. To these soils 7 grams of stem powder and 3.5 grams of leaf powder were added and thoroughly mixed with the soils. Then the moisture content was adjusted to 15 per cent on a dry basis. The ammonia content increased rapidly in both soils, but greater in the Dacca soil than in the Faridpur soil because the decomposition is accomplished by fungi which prefer an acid medium. The ammonia content remained at a high level until the 45th day, after which signs of nitrification appeared.

A comparison of water hyacinth compost with horse manure indicated almost equal manurial efficiency of the two.

Although water hyacinth is readily decomposed by fungi, it does not appear to be a satisfactory source of energy for nitrogen-fixing bacteria.

The soil experiments indicated that water hyacinth, if allowed to decompose in the soil, offers definite promise as a nitrogen-carrying manure.

A plant now regarded as a pest may be the source of mineral-rich compost.

The Value of Broccoli

By DR. DOUGLAS THOMPSON

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IS there anything that is quite so enticing as an occasional indulgence in that rather strange vegetable known as broccoli, which originated in far off Rome many centuries ago?

It was, in fact, the favorite dish of that great Roman ruler, Julius Caesar, who never considered a Roman victory complete on the part of his Roman general unless it was celebrated by the populace and that broccoli was a part of the home-coming dinner.

While Julius Caesar's knowledge of food may have been somewhat limited, as far as the scientific phase was concerned, he yet knew that this enticing vegetable had contained within it some elements that were good for his warriors and his people.

Broccoli contains twelve of the sixteen chemical elements found within the body. Few foods contain as many, and fortunately for us, these elements are twelve of the most important.

The very first is chlorine, that very mysterious chemical, and the next is water, Nature's solvent. The third element is fluorine, the dental protector of the body.

The fourth element in broccoli is that known as iron which is found in one's blood stream, and the fifth is that life-giving element known as oxygen. Then, there is potassium, out of which both nerves and brain tissues are created.

The seventh element is that blood cleanser known as sulphur, and the eighth is calcium, the bone builder. Broccoli also contains magnesium, the fortifier of the bony structure, and manganese, that illusive substance that attempts to take the place of iron when it is lacking in the body.

The eleventh element is that of phosphorus, the backbone of the blood stream, and the twelfth is our good friend known as sodium.

Broccoli is, by the way, a splendid alkalinizer of one's blood stream, and is fortunately one vegetable that can be secured the entire year around, whether it be spring, summer, fall or winter.

It takes but three hours to digest and contains 160 calories for every pound of its own weight. It is also rich in Vitamins A, B, and C. When steamed, it is indeed a most enticing dish, and since it is a non-starchy food it can be used with any starchy food or dessert, and even with any type of protein food.

Why not try a serving of broccoli at your next luncheon, by having a grated raw carrot, apple and date salad with mayonnaise and garnished with a sprig of parsley, a clear vegex consumme, a serving of steamed broccoli with sliced lemon, a serving of steamed beets with butter sauce, a slice or two of whole wheat toast, with butter, and as a dessert a cup of custard.

ASPARAGUS Without Trenching

By J. A. ELLIOTT

THE idea that asparagus has to be planted in a trench is the most harmful bogie in horticulture. I have been fighting it for 15 years and it looks now as if I am winning; the deep trench is no longer the common recommendation that it used to be.

Trenching Not Natural

The trench is the chief reason why this delicious vegetable is not found in every home garden. People read the elaborate trench directions, consider the amount of work involved, *and then do without asparagus.* Or if they do plant in a trench and happen to cover the roots too deeply (or a rain does it for them) they are likely to have severe loss. That is what happened to me; a rain filled the trenches with mud, smothered the roots, and I lost 285 out of 300. A man told me he lost all but 6 out of 200 that way, and a woman told me she bought 50 roots from one of the country's best seed houses and lost them all. I said to her, "If you had planted them at the surface you wouldn't have lost one," and she replied, "But why didn't the seed house tell me that?" I couldn't answer her; I presume that they don't know that the trench method is wrong for the home garden; neither do the rest of the recognized horticultural authorities; they cling to the trench idea because it has always been used; and is still in use by the great commercial growers. But they never stop to think that the commercial men have a light sandy soil that asparagus can push up thru readily whereas the average home

garden has a loam that packs and smothers.

Plants Survive Surface Planting

The few cases of loss I have mentioned are only samples; I could cite many others, for I am in the business of selling asparagus plants and hear the same story over and over again every year. On the other hand I have sold to about 1000 customers throughout the East and have never had a loss that could be blamed on surface planting. For surface planting works every time; it cannot fail because it is the natural way for the plant to grow. It grows wild here and there all over my farm from seed planted by birds. And why is it that discarded asparagus plants, thrown on a rubbish heap to die, take root and go right ahead? If the trench is necessary how can such a thing take place?

No, the trench is not necessary. I have been surface-planting for 15 years; it never fails and it produces just as good or better plants than trench planting. By surface-planting I mean simply setting the plant at the surface like you would any other plant—a peony or rhubarb for instance—for asparagus is just another perennial. When I set it I simply open a crack in the ground with a spade, slip the root into it till the crown is about half an inch below the surface, and stamp the crack shut. When people see me do it they invariably ask "Is that all?" Yes, that's all.

If that's all why then have we the asparagus trench? Well, there were two reasons but one of them died recently; it was the demand for white stalks and thank goodness I had a hand in the killing. The other one is still alive; it is the love of the commercial grower for the disk harrow. He uses it over the plants in the spring, and in order to avoid injuring them he has to set the roots deep, and that means in trenches. This puts them in the lower half of the top soil, the upper half being reserved for the harrow; how the plants like this when they know all other plants get the use of all the top soil I don't know; I suppose if they don't like it they can go down into the clay and lump it. But according to one authority they have hope of getting to the top some day, for he says that no matter how deep you set an asparagus root it will eventually work to the surface.

Trench Planting Invites Erosion

How this could happen puzzled me for a while as the plant has a rhizome root like iris that grows only horizontally; it can't grow either up or down. But the puzzle was solved one winter day as I passed through the Morrisville, Pa. asparagus district; no snow was on the ground and I could see what was going on. There was the asparagus field without a spear of grass or weeds in it to check erosion; nothing but the dead tops of the plants standing in the bare soil like uncut corn. Apparently that soil is bare the year 'round and throughout the life of the planting, probably a dozen years or more. That's how the roots "work to the surface"; the surface comes down to the roots because the soil has gone to sea. Isn't it about time that kind of folly was stopped?

Asparagus can be planted at the surface and grown like corn; a neighbor of mine who does that tells me that his horse-drawn cultivator clips a few roots but that the plants don't seem to mind it; he has been handling them that way ever since the piece was planted 12 years ago, and he gets more asparagus than he can use. I imagine he uses a shovel type cultivator; a sweep type cultivator probably wouldn't cut any roots at all.

Asparagus is Easy to Grow

For those home gardeners who want to try asparagus I offer the following suggestions. Don't hesitate; it's as easy to grow as weeds. Put plenty of manure into the ground and use plenty as a mulch. Also buy plenty of plants because if you don't you'll keep your bed stunted by cutting too close; you should have 50 plants for each member of the family, and more if you expect to freeze any. Never cut a thin stalk, and stop cutting about June first (latitude of New Jer-

sey). If the roots are too expensive buy seed and grow your own; it's easy. However the roots don't generally cost you anything because the first two crops usually refund your money; after that it's clear profit. There are some good things in this life that most folks miss; one of them is asparagus that has been cut and cooked within the same hour; to get that you have to have it in your own garden.

ASPARAGUS in Trenches

By M. B. CUMMINGS,
Professor Emeritus, University of Vermount

THERE are three reasons why asparagus roots should be planted in trenches. First, because the new crown comes on top of the old one and the natural result is that the plant elevates itself a little after the first few years. If planted at the surface the crown roots become too much exposed. In the second place, surface planting may, in many parts of the country be subject to winter injury, if too near the surface. Alternate freezing and thawing throughout much of the winter unduly exposes the crown and its buds to winter injury. This may not kill the plant but often does weaken it.

In the third place summer drought of much duration and intensity, may also weaken the plants. The top of the crown generally speaking needs protection. Several inches is not too much, but there need not be more than 4-6 inches. Many buds are weakened and are low in yields because of too much exposure.

By a trench, I do not mean a ditch or a grave. The compost or manure or both that go into the bottom of the trench make it more shallow than when first dug. It has been shown that buds live longer, and yield better if well covered, than if only shallowly protected.

It is incorrect to say that the average home garden has a loam "that packs and smothers." Some may be that way, but many more are not that way. Any garden soil that packs and smothers, is not any good for asparagus, or even for other plants. Such a soil—if it must be used, needs a lot of compost added to it to improve its texture and for other reasons, also. If compost is used in the soil at planting time, and thereafter as I suggested, the soil will not pack down and smother the plants. The result of hard soil will be averted.

May I also add that I would not use for asparagus a soil that requires a pick to get the plants set. Select a good soil free of hard clay, rocks and hard pan. Use such soil for other plants. Asparagus needs and justifies a good soil or one that is made good, by the suggested amendment of compost.

One other important point; I would cut out the thin slender shoots. If left, they soon become weeds, crowding and robbing the good plants that give edible shoots of quality. Moreover, do not let the plants go to seed and the bed become self sown. Pick the seeds, before ripe and save the food they use, for storage for large edible stalks another year. Volunteer plants in the asparagus bed are seldom needed. If well composted soil is used, those set out as original plants will be enough to soon occupy all the land. Let them have all soil and its ingredients without competitors. Asparagus needs more care in setting than cabbage; it lasts much longer and gives a higher quality product. When planted out the specimens need more than a crack in the soil, if they are to do well. Good care from the start, insures good results.

BOTANY FOR THE GARDENER (19)

By DR. WILLIAM H. EYSTER

MOSSES

IN putting down the Earth's Green Carpet, Mother Nature seems to have left bare spaces which she often covers with rug-like clumps of closely crowded and beautifully green moss plants. Who does not enjoy walking over the deep, cushion-like beds of moss plants in our woodlands? Mosses occur in all latitudes and in all kinds of habitats. Some kinds grow in quiet pools; some are attached to rocks in precipitous streams and in waterfalls; some on bare rocks which are exposed to the air; some on the trunks and branches of trees; some on decaying wood and on soil which is rich in decomposed wood; some in bogs and marshlands; and some on relatively dry land in open fields. Not all mosses are adapted to all these conditions, but each habitat has its characteristic species of mosses.

Many mosses have remarkable capacities for adapting themselves to changing environmental conditions. Under favorable conditions of moisture, they grow and reproduce rapidly and luxuriantly. When the water is withdrawn, they seem to dry up and become dormant but in this condition may remain alive for months or even years. More than once mosses which had been kept in a box on a shelf in a laboratory supply room for a year in a dry condition were observed to resume growth within a few days after being put into water. Such observations give one a new appreciation of the ability of mosses to remain alive in a dormant conditoin when the environmental conditions are unfavorable for growth.

The moss plant consists of a cylindrical stem bearing spirally arranged leaves. The stems are not highly differentiated and the leaves consist usually of a single plate of cells. As a rule mosses grow in large, closely crowded colonies to form beds or cushions. This favors reproduction as in some mosses the male and female sex organs are produced in different plants. Mosses may easily be distinguished from leafy liverworts which have their leaves arranged in longitudinal rows rather than in spirals as in mosses.

Sphagnum or Peat Moss

There are many species of peat moss but all belong to the same genus *Sphagnum* (Fig. 53). They grow in

FIG. 53. A Sphagnum moss plant commonly known as peat moss.

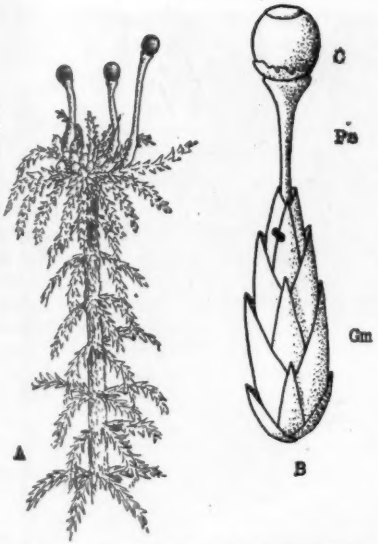


FIG. 54. A is a branch of Sphagnum moss with a cluster of the sporophytes growing parasitically on the gametophyte. B is a single sporophyte enlarged to show stalk and spore-producing capsule. *c*, spore capsule, *Ps*, the stalk, *Gm*, the gametophyte branch tip shown in A.

wet places or in water, as in ditches, swamps, ponds, and even lakes. The plant with which we are familiar is the gametophyte, so called because it produces the sex organs and gametes. These sexual plants grow indefinitely at the stem tips, while the older parts die and accumulate at the bottom of bodies of water as peat, or grow out from the shores of ponds and small lakes to form quaking bogs which eventually become transformed into peat. The stem grows upright, often attaining a length of more than a foot, and branches freely. Both stem and branches bear leaves. Near the tip of the stem are a number of short branches, each of which forms a cluster of secondary branches. These clusters of branches, crowded together about the tip, form the conspicuous "head" of the plant, as illustrated in Fig 54. The head is commonly pale green but may be yellow, brown, purple, or red in color. At intervals on the lower part of the stem occur other branches, usually in tufts of three to eight. In species of Sphagnum which ordinarily do not grow submerged in water, some of the branches of a tuft are comparatively long and slender; these branches hang downward close to the stem and, with similar branches from other tufts, form a loose covering about the stem. Other branches of each tuft extend outward and upward. Most of these latter branches remain short, but sometimes one of them continues to grow upward and repeats the structure of the stem, including the branching and forming an apical cluster of branches.

The continued upward growth from year to year of old and new plants, results in pressing down and compacting the dead portions below which, together with the embedded remains of other plants and of small animals, constitute one of the chief sources of peat. Because of the organic acids which are formed and the exclusion of oxygen, these organic substances are

(*Continued on page* 48)

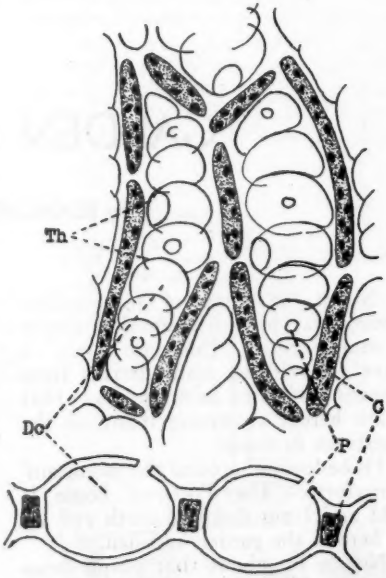


FIG. 55. Cells from a mature leaf of Sphagnum moss. *Th*, thickenings, *Dc*, dead cells which are large and empty. *P*, pores through the walls of the dead cells. *C*, cells with chloroplastids which carry on photosynthesis.

GARDEN AT EDEN

By BLANCHE FEWSTER

IN last July's issue of *Organic Gardening* was published another article of mine entitled, "Down to Earth." I have received so many letters from persons interested in my projects that I am herein answering many of the questions in mass.

I'll be 'comin' around the mountain' henceforth. The Portland home is sold and I am down to earth and up to here in the garden at Eden.

Now a bit about that purple bean that I mentioned and said that I would give more later—well, this is that later. The beans themselves are a royal purple which turn to a nice green when cooked. They 'can' exceptionally well. The blossoms are a deep lavender, the stems and veins of leaves a dark purple. The beans set on thick and in clusters. Even when the bean grows to a foot and a half long it is still tender and stringless. I generally pick them at the foot length. They make nice shell beans and are delicious cooked with corn as a succotash and a twig of Rosemary added.

The following is my planting method: set four poles so that they are eight feet above ground. Set them deep so a wind or weight of bearing will not unbalance them. Scoop soil

out in a circle making a dam of it in a ring around pole. Refill the hole with compost, almost full. Put on a thin layer of sand and plant bean seeds, finish filling with compost and press down. This refill should be slightly lower than the circle of soil around pole. Mulch with lawn clippings when beans get up and looking around. Do not hoe but pull out weeds by the neck as they come up. Train beans up pole and when they get to the top of poles lay a pole between tepees and train across from tepee to tepee; pinch back additional length. I wanted to see just how high they would grow if left to their own desire and planted a twenty-four foot pole for one hill. The vines ran up to the end of that and waved a jolly welcome two feet out in mid-air.

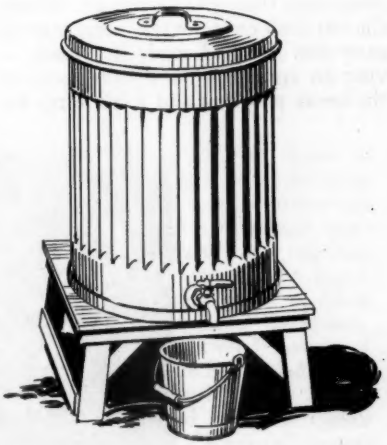
Just as the beans begin to set on give each a good drink by filling the circle around each pole with compost water. The dam will hold the water until it sinks in deep and the grass clippings will prevent evaporation. The watering from then on depends on the weather. This last season I watered only once—as beans began to set. I picked beans from the step-ladder and had more than I could possibly use or give away; both as green and shell until frost.

I find that a large metal container such as the one used as a garbage can makes a splendid tank for making compost water. The lid eliminates any objectional odors or chance of anything falling in. I use rain water whenever possible with which to fill it. The compost is tied into a gunny sack and set to soak. After a refill of water is used, the compost is added to whatever particular plant that is in favor and the process is repeated. If the compost gets a week's soaking, I dilute the water, judging by the color of the water as to how much.

I simply must get my finger, the green one, in this tomato growing-pie. There seems to be so many exponents pro and con—tie them up; let them lay; trim off the laterals, leave them on; irrigate or refrain; thin the leaves, leave them all. I let the tomato plants go native.

First I spade the whole patch. Second, set foot high stakes deep where I expect the tomatoes to come in the rows. Third, dig hole around said stake and refill with compost. Four, set tomato plant—deep. Over the entire plot I put a four inch layer of straw (from that old barn that I mentioned last July). When a weed sticks its head through I simply yank it up. The plants grow as they like. Just as the blossoms begin to set, I pull out the stakes, leaving the hole. Into this hole, once a week, I pour a quart fruit jar full of compost water. The straw has kept the fruit up off the soil and I have not had any rot, scorch, blight, or bugs using this method. My neighbors seem to have hit the jack-pot of tomato troubles with their tomatoes but I had more than enough fruit to share.

Furthermore, I planted bergamot around the edge of my tomato plot. Bumblebees will come a long way for bergamot blossoms and the fact that bumblebees are one of the few insects equipped to pollinize tomatoes this insect is a decided asset in getting fruit to set. As they fly back and forth over the patch to get at the bergamot they



Suggestion—self explanatory—easy to make

naturally stop off on the tomatoes. This works splendidly besides bergamot is a grand kitchen herb; which brings us to my *Magic Garden.*

Herbs, herbs, hersb! At last I have room enough to take my herbs out of just rows and from being tucked in here and there and really form knots and interesting color designs with them. I have room to add a few "simples" and a collection of tizanes—truly a magic garden worthy of Eden. I aim to use rock for mulch and pebbles for pathways in this department.

Out of the big garden—as we call the orchards of walnuts, filberts, and apricots we had new interest this year. The apricots that I mentioned in my last article came into bearing this season. These apricot trees have never been sprayed. The only attacking disturbance that I have had was a slight attack of twigborers in the early spring. I sent a sample to the State College and they told me I had peach twig borers and outlined a drastic spray program that I would have to use. My trees never have been sprayed and I was not starting in, so I collected up a step-ladder, some gunny sacks and my trusty clippers and set to work on the orchard. I cut off the infected twigs back to a healthy bud put the twigs in sacks and burned the collection. It was a job but the 125 trees came through beautifully. Where the cut limb ends, lovely green sprouts grew out nicely. I made it a point to visit an apricot orchard that received the spray program and I felt sorry for those sad looking trees. I do not spray for peach curl on the apricots and it is claimed by the "spray 'em" addicts that apricots are more susceptible than peaches. Even some of the sprayed orchards in the valley below me had it. I did not have a sign of curl-leaf. I always disk the orchard and leave it quite rough and hoe around each tree and whitewash the trunks. I make it a point to be sloppy with the whitewash so I get some spattered on the ground, then hoe it under; and of course, I work compost and extra worms around each tree. This year I added a beehive to the orchard.

The variety of apricot is Perfection. The "cot" fruit measured five to the foot and that is field run and not a few selected specimens. After looking at those big golden apricots I thought, "I'll bet if they were in the original Garden of Eden that Adam would have grabbed an apricot in preference to an apple before poor Eve had a chance"!

Now that I am living on my land I have more time to experiment and can go more extensively into gardening. I hope to branch out to include animals, too. This would complete my circle—organically impregnated manure to turn into compost to grow more organic vegetables. That is my goal now. The article on page 27 of July, 1947, *Organic Gardening*, "DDT on Crops Can Poison Meat" is just one of many fine articles that show that spray and poison can crop up here and there in unexpected places.

Plants for the Rock Gardener—"Snow in Summer"

By G. L. WITTROCK

New York Botanical Garden

ONE never deliberately plants a weed in his rock garden yet there are some relatives of weeds that find their place in a planting, not as weeds but as selected, attractive plants of horticulture. Our plant "Snow in Summer" is one of these. Weeds, in general, often play an important part in nature, reclaiming devastated soil and nursing its fertility for future reclamation. Historically all weeds have at one time been important in medicine, food, sources of dyes, beverages and even fibers, their history being associated with man since the dawn of civilization, invading man's cultivated fields and gardens though sometimes serving him in some economic way. Some of these weeds or their relatives have captured the eye of the horticulturist, particularly "Snow in Summer." This is a species of Cerastium, the "Mouse-ear Chickweed" genus, of which 100 species are listed and found throughout the world. The name Cerastium is derived from the Greek word "Keras" and "Keratos" meaning a little horn, in allusion to the

shape of the capsules of some of the species resembling the horn of an Ox. However, over 18 species are listed as attractive plants for rock gardens and edgings because of their soft foliage and their tenacious growth habit.

Any lawn may have a colony of these "Mouse-ears" matting and crowding the lawn grasses, particularly under trees. They are easily distinguished from the "Chick-weeds" by their greater woolly nature and the structure of their flowers. Our selection, the "Snow in Summer", *Cerastium tomentosum*, is a most easily grown plant and very attractive throughout the summer by its matted, dense colony of gray woolly foliage and densely, white, compact flowers. The plants are perennial with a creeping root system forming densely tufted mats, the whole plant being thickly covered with a white down of tomentose hairs. The branches are forked and bear either a single white flower or a cluster of flowers forming a sort of umbel on floral stems 6 inches long. The leaves are about ¾ of an inch long and ⅛ of an inch wide. In its alpine habitat, high in the mountains, the colonies observed from a distance suggest patches of unmelted snow among the rocks, due to their hoary appearance, thus giving the allusion of "Snow in Summer". The plants bloom through May and June.

Snow in Summer, having been known to man for so many centuries, is recognized by many local names in many languages, some of which are most descriptive, such as "Woolly Mouse-ear", "Dusty Husband", "Dusty Miller", "Jerusalem Star", "Love in a Mist", "Silver Moss", "Snow in Harvest", "Snow on the Mountain" and "Snow Plant". In France it is called "Oreille de souris", "Ceraiste tomenteux" and "Piloselle", while in Germany it is spoken of locally as "Filziges achergras or Hornkraut", "Kriechendes mauscherlein" and "Schneekraut". The Dutch also know it as "Silvergras" and "Silver kruid".

This easily grown rock garden plant is attractive for edging of formal beds or borders and in rockeries where it will grow wild if not controlled. The species is an alpine plant native of the mountains of southern Europe from France to Switzerland, Germany and east to Greece. It has been in cultivation in the Old World since 1648. Propagation is by division of plants, by cuttings taken after the flowering period is over, or by seeds. The plant rarely fails, surviving in any average garden soil.

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— ROBERT RODALE

An Appliqued Bouquet — You may brighten a room by appliqueing a colorful bouquet of spring flowers from bits of felt pasted to a piece of canvas board.

THE picture illustrated was "painted" with two shades of red and two shades of green felt for a pallette, and then made to sparkle by the addition of a few silver sequins.

First of all the completed picture was sketched on a piece of paper, with the colors indicated by initial. And of course all of the shapes were kept very simple.

Then each part of the picture was traced separately on tracing paper with a soft pencil. These parts are then cut out and used as patterns for the felt pieces.

Start with the stems,—cut them from the felt, and carefully paste them where you wish them on the canvas board, using household cement or rubber cement. Next are the leaves, and last of all the flowers, and the bow knot.

When this is finished a sequin is pasted in the center of each of the small flowers, and a cluster of sequins in the center of each large flower.

Of course a simple frame will add importance to your finished picture, or it may be hung as it is.

—MURIL MANAHAN

BEGONIAS for the Window Garden

By BESSIE RAYMOND BUXTON

(CONTINUED FROM MARCH ISSUE)

THESE three begonias need a sunny window, sandy soil and careful watering, especially in winter.

B. ulmifolia was first found in India (1818) and in 1854 in Venezuela. It is well named, for it really looks quite like a young elm tree. Its rough, bright green leaves are just the size and shape of an elm leaf, and rough-hairy on both sides. It is a winter bloomer, with terminal clusters of small white flowers.

B. cathayana is the handsomest of the hairy begonias, a Chinese species (1908) with emerald-green velvet leaves, ruby veined, and a zone of lighter green. The colors are reversed on the under side, to ruby velvet, green veined and zoned. The stems are white-hairy and the flowers a soft orange color. It is not easy to get nor to grow, as it needs warm, moist air, difficult to supply in a house. It prefers a north light, as the velvet leaves blister and fade in the sun.

B. malabarica, one of the very earliest known begonias (1650) is a native of India. It is rarely grown, but *B. malabarica dipetala* is quite popular, perhaps because it is one of the few Christmas bloomers. It is better known as *B. Mrs. W. S. Kimball,* although who the lady was or who gave it her name is a mystery. The plant is tall and stout, with very short branches, often unbranched. The veins of the flat green leaves are deeply depressed, and bright red beneath. The stems also are red, and there is a bright red spot at the sinus. The stout green trunk, or stem, is curiously marked with scattered scarlet spots. No other begonia has this marking. In December the pale pink flowers appear in axillary sprays, and continue for four or five months. It likes warm growing conditions. If grown in a sunny window the flowers will be a deeper pink, but will not last as long as in a north window. Sometimes the red edged leaves are silver-spotted, but always are set on both sides with short, stiff white hairs.

Most of the spotted leaved begonias

Begonia — Glory of Cincinnati

are not as free bloomers as the other kinds, but their foliage is so lovely that we do not miss the flowers. The well-known Trout begonia (*Argenteo-guttata*), one of Lemoine's crosses, is still popular and deservedly so. The dark green lobed leaves are heavily silver spotted and rival the greenish-white flowers in beauty. It is a bushy, well-branched plant, and will grow well without sun. In fact, most of the spotted leaved begonias have handsomer leaves if grown in a North window.

Another familiar friend is Lucerna, or *B. Corallina de Lucerna.* It is named for the city of Lucerne, Switzerland, where it originated. A tall grower, it will reach ten or twelve feet when grown in California or Florida, but house plant growers must content themselves with a mere five or six feet. Early pinching of the tip will induce branching and keep the plant within house bounds. The thick waxen leaves will grow nearly a foot long and half as wide, deep green with scattered silver spots above, deep red beneath. The rose-red flowers, with a conspicuous white spot on the ovary, hang in clusters, eight to ten inches across. This is one of the best begonias for the house, for it grows quickly and begins to bloom when quite small. It is seldom without flowers.

B. Lucerna has been much used in hybridizing and the late Alfred D. Robinson of California, produced a series of outstanding seedlings which he named for Swiss towns and lakes to indicate their parentage. The leaves and flowers of these seedlings are smaller than those of *Lucerna,* and none are as free bloomers. The leaves are darker, some almost black, and most of them are spotted. Alzasco is one of the handsomest, the dark leaf ruffled and twisted. Interlaken has lighter green leaves with a sharply angled and pointed shoulder. Lugano's dark green leaves are handsomely serrated, sharply pointed and set very erect on the stalk. Lecco has a rounded top and blunt tip, heavily silver spotted and tipped. Codelago is darker red beneath than the others. The dark leaf of Lucendro is unique in having the terminal tip entirely silver. Helen W. King has unusual flowers, pink, in tight bunches close to the stem. Maybelle E. is more heavily silver-spotted than the others and rarely blooms. Other seedlings are less well-known and not as outstanding.

Orrell has very light green leaves, silver spotted, with ruffled edges. The flowers are cherry-red, but it is not a free bloomer. It drops its leaves badly under house conditions, but is a handsome plant when well grown. This plant was named by Mr. Robinson, but is not one of his seedlings.

Elaine is very beautiful, but not easy to grow. The long leaf is olive green, silver spotted, deep red beneath and always half folded. The flowers are rose-pink. It likes warm growing conditions and protection from drafts. It is credited to William Grant of San Diego in 1928.

B. aconitifolia was named for the aconite or monkshood because the leaves are cut in similar fashion. It is a Brazilian species (1859) and from time to time has had new names bestowed upon it. A tall, shrubby grower, the stems are swollen at the base. The large leaves are deeply and coarsely lobed, the stems and veins quite reddish beneath. The silver markings are irregularly splashed, not spotted.

It blooms in the fall, large waxy-white flowers, flushed pink outside. *B. aconitifolia var. Hildegard Schneider* is also a Brazilian species, perhaps a seedling or a variety of *B. aconitifolia*, and has also borne several names. The present name was given by the New York Botanical Gardens in 1940. Its habit of growth is like *B. aconitifolia*, but the leaves are quite different. Deeply and sharply cut into five lobes, the second lobe is much longer than the others, like a pointing finger. The veins are deeply depressed, giving a crêpe-like texture to the leaf. It is more conspicuously silver-splashed than *B. aconitifolia*. The flowers are similar.

Lobata variegata is another difficult plant, prone to drop its handsomely lobed and spotted leaves. *B. dichroa* (Brazil 1906), too, is difficult, a slow grower, needing heat. It should be grown in a hanging pot for it is always low and drooping. The thick leaves have an awkward shape, rhomboid-elliptic, four to five inches long, dark green, silver spotted. The flowers are its redeeming feature, a brilliant orange, the rarest color for begonias. It blooms intermittently over a long period. It has been much used in hybridizing, but none of the seedlings have the wonderful orange flowers of the parent. Di-anna, Di-erna and Annie Laurie, all Robinson hybrids, have inherited its long-blooming qualities, but their flowers are in shades of pink.

B. diadema (Borneo 1881) is a tall, lanky grower, with five-parted leaves, silver spotted, and a purple flush at the sinus. The flowers are white, pink flushed. It needs warm growing conditions.

Volumes might be written about the Rubra group. They are descendants of *B. coccinea* (Brazil 1841) and the flowers range from white to deep red. They are tall, lanky growers and have the annoying habit of not blooming until they are too tall for the average window garden. Many of them have spotted leaves. Other spotted kinds, well worth growing are *B. albo-picta, B. Medora,* of unknown parentage, or the two with yellow-blotched leaves, B. Templinii (Ohio 1905) and B. New Hampshire, another unknown. Three begonias have striped leaves, *B. compta* (Brazil 1886), *B. angularis* (Brazil 1845) and *B. acutangula,* perhaps a seedling of *B. angularis.*

The small leaved group includes *B. foliosa* (Colombia 1825), quite fern-like in effect, *B. fuchsioides coccinea,* with tiny scarlet flowers, almost like fuchsias, and *B. fuchsioides rosea,* which has clusters of small pink flowers.

The semperflorens kinds are well known, easy growers and dependable bloomers. The Rex grow best in summer, but there are a few green-fingered people who can keep them looking well in winter. Among the hundreds of begonias available, we can experiment until we find the kinds best suited to our conditions. Then it will be fun to try the rare ones, the new hybrids, the new importations. Some of these may bring trials and disappointments, but they will only make us value more highly the old dependables, and the successes will repay us for all they cost.

Begonia feasti

The Soil and Health Foundation

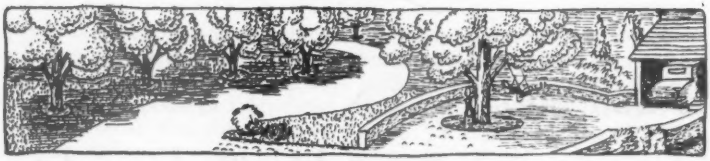
— ROBERT RODALE

INTERIOR OF SOIL AND HEALTH FOUNDATION LABORATORY

The Soil and Health Foundation Laboratory is now equipped with apparatus and materials, and ready for a properly trained bio-chemist to put it into operation. There is urgent need for this as indicated in the following letter received from one of our associate members:

Dear Sir: ..... We would like to know if individual members will be able to get soil and produce tested when you get into full operation. For instance, we have had to resort to the courtesy of the International Harvester Company to get some testing of hybrid vs. open pollinated corn. It was interesting to find that all hybrids lack from 6 to 9 minerals including cobalt, and have far too much iron.

Anybody may become an associate member of this Foundation by sending a contribution to the Secretary, Soil and Health Foundation, 46 South West Street, Allentown, Pa.



Garden Calendar—June

THE NORTH

The spring-blooming perennials reach their greatest triumph in the Rose, Queen of the Garden in June.

Flower Garden. If not already done, sow seeds of biennials and perennials. Some that you will not want to miss are sweet william, oenothera, canterbury bell, foxglove, and lupines. The lupines should be seeded where they are to grow to maturity as they develop a strong taproot and cannot be transplanted without injuring the plants.

Keep the rose bushes well mulched with compost superposed with a coarser plant material. Also carefully remove all leaves which appear diseased as well as all insects and remove them to the compost heap. In cutting roses leave enough foliage on the plants to keep them healthy and vigorous.

Dahlias can still be planted, but do not delay too long. Also seeds of heavenly blue morning glories may still be planted early in June. Make succession plantings of gladiolus, babysbreath, and poppies for prolonging the flowering of these plants through most of the summer and fall. Be sure to try some everlasting flowers as strawflowers and immortelles for autumn colors and winter bouquets. Creeping verbenas should be given some support to keep them off the ground and free from musting from rains. They deserve more use as cutflowers.

Irises should be cut back as soon as they have finished their growth and show signs of maturity. Narcissus bulbs should be taken out of the earth and stored in a cool, dry place for fall planting. Later in the month bulbs of snowdrop, scilla, grape hyacinth, crocus, fritillaria, and chinodoxa can be similarly taken up and stored for planting in the fall.

Open places in the garden should be planted with started annuals or perennials, as calendula, zinnia, calliopsis, linaria, and chinese asters.

Pyrethrums should be taken up, divided, and reset so that they make a good growth before winter. Rock plants of all kinds may be increased by making cuttings at this time. Pinch out all but the main buds of dahlia, chrysanthemums, and delphiniums if you wish large specimen blooms. Remove the poorest stalks of hollyhocks to improve growth in the stronger stems.

Shrubs. Remove the fruit clusters from shrubs which have finished blooming as azaleas, rhododendrons, and others without ornamental value. Keep shrubs mulched. All shrubs should be pruned as soon as they have finished blooming.

THE WEST

Flower Garden. The blooming period of the perennial border can be greatly prolonged by keeping all faded flowers removed. This can also be accomplished by being generous with your neighbors and friends, because a border from which cut flowers are taken frequently lasts longer than one from which cuttings are not made. Cut delphiniums back to the ground level just as soon as the first blooming period has ended. New stems will develop and insure you with new stems for fall blooming. Canterbury bells and phlox will react same as the delphiniums.

Chrysanthemums and dahlias may still be planted in June. Irises should be taken up, divided, and reset this month. Heat-loving annuals as zinnias, salpiglossus, schizanthus, and cosmos can be planted in the garden this month. Also set out seedlings of ageratum, coreopsis, gaillardia, marigold, petunia, portulaca, tithonia, and zinnia for the fall garden. Sow seeds of such perennials as columbine, carnation, alyssum, coralbell, nierembergia, verbena, and violet. For fragrance in the garden grow jasmine and natal plum.

Move the house plants into the garden and give them positions most suitable to their natures. Some will prefer dry sunny locations, others must have some shade.

Shrubs. Faded roses should be cut off with a sharp knife. Prune spring-flowering shrubs immediately after the blooming period is ended.

THE SOUTH

June is the month for heat-loving annuals in the South. This is particularly true of plants belonging to the composite or daisy family.

Evergreen candytufts should be divided and replanted this month. Others which will benefit from replanting are creeping phlox as divaricata, canadensis, and subulata all of which are excellent for ground cover and borders. Shade newly planted camellias. For fall color in the shrubbery, plant miniature sunflowers, tithonia, and tall ageratum. Separate and replant also Dutch irises, evergreen candytuft, and poinsettias.

Choice petunias can be propagated by layering. Do not overlook Salvia farinacea and dwarf phlox, portulaca, and gladiolus.

Shrubs. Azalea, holly, boxwood, and other choice broad-leaved evergreens should be given liberal dressings of compost. Magnolias and mimosa are in full bloom and are a sight to behold. So also the blue-flowered chaste trees and the white, pink, and cerese flowered crepe myrtle trees which seem to symbolize the South. Wisterias require summer pruning to keep them within bounds. Do not neglect them. Fall blooms may be had by planting now such shrubs as duranta, lantana, hibiscus, the fall-blooming cassias, clerodendron, plumbago, daubentonia, and cestrums. Plant palms in June also.

SOUTHERN CALIFORNIA *

Flower Garden. June is the transitional month in gardening in the warmer sections of California. The spring flowers are just passing out and immediate planting for summer and fall coloring should be rushed. Choose varieties which are heat resistant. If you have not raised your own, the nurseries are well stocked with both perennials and annuals in gallon cans and plant bands. With plenty of water down underneath and good mulching, even plants which have reached the blooming stage, can be transferred to your beds and borders. Pentstemons, salvia leucantha, salvia (blue bedder), yellow and white marguerites, hybrid arctotis, Aster Frikarte, carnations and narrow-leaved sunflowers will furnish abundance of bloom until the early winter planting season. Chrysanthemums and dahlias can still be set. Such annuals as wilt-resistant asters, cosmos, zinnias, French marigolds, African marigolds, ageratum, petunias, lobelia, Phlox Drummondi and verbenas flourish in the summer heat. Nierembergia hippomanica makes a very floriferous edging. Sown in place Tagetes signata pumila, sanvitalia, anagallis and zinnia linearis, make excellent edgings for the remainder of the season.

By the last of the month the spring bulbs can be dug, divided and replanted. They are better off in the ground with a ground cover of shallow-rooted annuals than left out of the ground until fall. In replanting, prepare the soil to the depth of eighteen inches, incorporating flour bone meal and compost. Iris, too, can be dug, divided and replanted at this time. Many of the evergreen

* Charlotte M. Hoak, 1125 Stratford Ave., So. Pasadena, Calif.

bulbs, agapanthus, amocrinum, clivias and crinums, can be planted in permanent position from established container. Daylilies (hemerocallis) are one of our most substantial perennials which require the minimum amount of care. There are many fine new evergreen hybrids offered locally. Old Sir Michael Foster is still one of the most continuous bloomers. Biennials and perennials for early spring color to be set in September and October, can still be put in but unless you are properly equipped to raise your seedlings in shaded seed-beds watered by special sprinklers, it is better to buy your plants from your nearest nursery. Mulch liberally with compost and lawn clipping to conserve moisture. Water through mulches. Compost can be made very rapidly throughout the entire dry season by using Maye E. Bruce's Quick Method either with or without manure. This method is a boon to the average home gardener with little space.

Trees and Shrubs. June is the ideal month for root cuttings from half-ripened wood-abelias, azaleas, camellias, cistus, daphne, escallonias, Chinese holly and many other evergreens. Such deciduous material as lilacs, philadelphus, spiraea and weigelia can be started this way. Try a mixture of peat and Vermiculite as a rooting medium. Citrus and semi-tropicals may still be planted provided careful watering and mulching is not neglected. Well grown material established in containers may be planted throughout the summer season.

Annual blooming climbing roses like Belle of Portugal should be pruned after blooming but hybrid teas should neither be *pruned* nor *rested.* Be sure your azaleas and camellias are generously mulched with leaf mold or compost and are not allowed to dry out. *Avoid any commercial fertilizers.*

Vegetables. Continue planting all warm weather crops: bush beans, pole beans, lima beans, soy beans, sweet corn, summer and winter squash, okra, cucumbers and melons. Yams and sweet potatoes should be rushed in. Strong plants of late tomatoes, egg plants and peppers will out-distance earlier planted ones. Mulch thoroughly with grass clippings and compost, and water through your mulch, watering thoroughly rather than often. Lettuce may be raised by using the summer varieties: Great Lakes, Slobolt, Oak Leaf and Bibb. Tampala is one of the best hot weather greens.

THE LOWER SOUTH **

Flower Garden. Among the flowers that may be planted this month are gaillardia, globe amaranth, helianthus, morning glory, petunia, portulaca, salvia, tithonia, verbena, vinca, zinnia. If not already in the garden, it will pay to set out rooted allamanda, the standby for practically all seasons, with its bell shaped yellow blooms. Once started, additional roots are soon available for further plantings.

Vegetable Garden. Velvet beans, beggarweed, bene, chufas, alyce clover, cow peas, chicken corn, black June corn, crotalaria. During the summer season, when few crops are planted, the soil should be protected by some sort of cover crop as previous plantings are removed, and the waste material such as corn stalks, pea and bean vines, are transferred to the compost heap or box. If left to itself for a few weeks with the coming of the summer showers, a garden here can be overrun with weeds and wild grasses of almost unbelievable size. One of the favorite cover crops is crotalaria. If one cares for cow peas, this crop can do double duty by furnishing food as well as a cover crop.

Trees and Shrubs. Both trees and shrubs will benefit from generous applications of mulch, especially during the summer months. If compost is used as a fertilizer, it is well to apply a coating of this before the mulch is put around the trees. Continued trials seem to indicate that citrus trees flourish with organic fertilizer only; especially if such materials as ground rock phosphate and bone meal are incorporated with the compost.

** Edwin H. Abrams, St. Cloud, Florida.

COMPOSTING . . . *an Art a Business a Philosophy*

By PAUL PFUND
Elmhurst, Ill.

EARLY observations and impressions often play a significant part in later life. Sound principles always abide.

Recollections of father's composting methods and results are very vivid. Indeed the underlying principle has become integrated in my philosophy and in the sense that it deals with vibrant soil life it has even become romantic.

Father and mother, both natives of Switzerland, also both trained horticulturists, naturally exerted a strong influence, so my training was early and very rigorous. European preparation in their day was by apprenticeship. Father served his in France and Italy as well as in his native country. As was the custom then, he paid for the privilege so he learned well. There was no such thing as "Earn while you learn." It is my hope to do some reasonable measure of justice to their memory and efforts.

At every possible opportunity we would collect sod from near-by areas along roadsides and ditches wherever permission was secured. It was piled in orderly fashion, interspersed with cow and horse manure from one or two family cows, and from horses used for all transportation. All possible additional quantities were also brought in. The horse manure was usually first used for hotbeds. More or less time was allowed for fermentation, but rules were not strictly adhered to, and since the soil was virgin or nearly so little if any attention was paid to the mineral content. I do not recall that lime and phosphate rock were added. The consistent remarkable results which were obtained attested to the fact that the soil was in good balance. Present day methods of soil analysis were not employed. Not a trace of artificial chemical fertilizer was used. However, a unique test was always a part of the verification of quality of soil and growth.

Greenhouses were maintained as part of the business operations which included landscaping in all of its phases as well as the culturing of a flower and vegetable garden. In the greenhouses during fall and winter were grown such relatively low temperature plants as large-flowering carnations, giant pansies and sweet-scented English violets. The most telling test however was on violets, for it was aimed to have them in full commercial production by Christmas with blooms large enough (when flattened out) to cover a fifty cent coin. I do not recall that we ever failed to accomplish this. I have yet to see finer and longer lasting blooms. Now one might reason that such a method of testing is too cumbersome and slow. Perhaps so. Nevertheless the final infallible test of the quality of any soil is still in what it will actually produce. The stockiness, disease and insect resistant nature of those plants is a picture which never leaves my mind. Composting has surely stood the test of time and contradiction, and is as inviolate and as firmly established as the laws of the universe. Surely it is high time to reiterate and reemphasize the all important underlying principles involved and to sound them forth in no uncertain tones.

The years have brought with them a widely varied horticultural experi-

A Typical Compost Corner

ence both in the North and in the South. With this has come an ever increasing consciousness of the complex nature of soil. Its marvelous functionings and faithful response to all who intelligently culture it. I stand in awe of its profundity.

In our landscaping operations we are constantly faced with soil conditions which are anything but conducive to immediate or lasting satisfactory results. The mere application of rotted manure or of the average topsoil generally falls short of supplying the real need. The answer is *compost.*

Good ideas go begging. Sound convictions are toyed with and the world suffers for want of that which it could and should have. Realizing a need many years ago for commercial quantities of compost we have, ourselves developed several types of compost, in which various natural minerals are being blended in proportion to the desired results of fertility and physical properties. Many gardeners who are profoundly convinced that organic gardening is the only true and purely scientific way, have no room for composting nor do they have time to carry on the process. Especially is this true in and around large cities.

Over a period of five or six years we have included the commercial production in our operations, of so called tender or greenhouse Chrysanthemums. Through the art of composting we have been enabled to bring into maturity the ideal potted mums of low stocky growth with a consequent complete elimination of the need for staking each plant to keep it upright. Among the multitudinous varieties of hybrids there are many with weak stems. Some of these were included in the assortment we grew, but in our compost they grew ideally. Other growers who use artificial chemicals and have seen our plants are flabbergasted. To their question "How is it done?" we answer, "It's all in the soil." Organic Gardeners, we as a group really have it. We are altogether too modest. Let us stand forth boldly and make Organic Gardening a part of our philosophy. The inviolate laws of the universe are back of us.

And now as to the philosophical phase. I have had a growing conviction for many years that it would be a means of considerable enlightenment and broader understanding to say nothing of added physical well being, if by some simple practical means in

the earliest possible years of instruction all children could be inculcated and imbued in heart and mind with the vital importance of soil conservation, and thereby have imparted to them a vivid and growing realization that from it comes all of our food, raiment and shelter. Such a program would continue gains made during the Victory Garden campaign in which many schools took part. I fear most children grow up with the impression that soil is just dirt, implying filth and therefore to be shunned. However, left to themselves we know they just naturally take to the soil as ducks take to water. Too many times have I seen children severely remonstrated and even punished for as harmless an act as playing in the soil. Let us give them the proper introduction to good mother earth and we will soon see a generation of more intelligent beings insisting upon measures for a truly scientific program of soil conservation.

We know that leaders in many fields of endeavor are coming to a stark realization of the serious decline in nutrition taken as a whole the world over. I am informed through reliable sources that our government is obliged to constantly lower its required standard of nutrition for the canning industry. All as a result of apathy, abuse, indifference and/or downright ignorance in soil husbandry. This indeed is not the concern alone of agriculturists but of every individual, for obviously we are all so completely dependent upon the products of the land.

Lines in the Face—O. G.

By MARION B. LARKIN

You've upset my life O. G.,
Myself and family.
From City to Farm
'Tis enough to alarm
A settled old lady like me.

Time was I'd a house, O. G.
With heat to any degree,
Now ice inside
Is my boosted pride.
You get what I mean O. G.?

With a maid and leisure, O. G.
I skipped through the days blithe and free
But now—take a guess!
Yes—it's strain and it's stress
For yours truly's the whole works—
Oh d....!

If the plumbing leaked O. G.
A call brought an expert M. P.
Now there's no phone
So we fix it alone
In spite of no a-bili-ty.

There were all kinds of shops O. G.
In Washington, D. C.
But now, thanks to you
We've boughten a view
Our substitute "new look" you see.

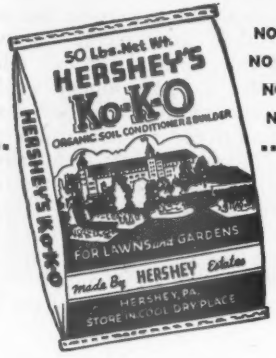
It's all due to you O. G.
Indoctrinating me!
Sometimes, by heck
I could wring your neck
But would we go back—not we!

(EDITOR'S NOTE:—An ever increasing number of people are growing tired of the artificial and congested life in the city, and are beginning to yearn for land and for growing plants. Such folks are moving out from centers of population and establishing new homes with enough land to grow their own foods or even to practice part-time farming. This makes it possible to provide the family with foods that are wholesome, foods rich in all the nutrients that are necessary for strong bodies and strong minds. The foregoing poem is the contribution of an *Organic Gardening* reader who left the conveniences and artificialities of the city for a place in the country.)

HELP STOP SOIL EROSION

With Humus

Found in Hershey's Ko-K-O



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NO WATER
NO ODOR
NO ACID

HERSHEY'S
Ko-K-O
ORGANIC SOIL BUILDER AND CONDITIONER

FOR LAWNS AND GARDENS

- Apply Direct to the Soil
- Mix in the Compost Heap
- FEED TO EARTHWORMS

An essential material for the Organic Gardener .... A slow-acting, long-lasting energizer that increases and replenishes the organic content of the soil .... Improves soil texture .... absorbs and retains plant-nourishing moisture .... helps decomposition of soil break-up into humus .... binds sandy soils .... loosens clay soils.

WHAT IS HERSHEY'S Ko-K-O?

Cocoa bean shells and other parts of the cocoa bean are expertly blended and sweetened to produce a natural, organic material furnishing a steady source of humus for the soil.

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NEW LOW PRICE

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HERSHEY ESTATES
HERSHEY, PENNSYLVANIA

Botany for the Gardener

(*Continued from page* 31)

not completely decomposed by bacteria and other organisms of decay. Chemical changes caused largely by anaerobic bacteria result in the formation of the spongy, dark-colored substance known as peat. Further changes including pressure may in the course of long periods of time lead to the conversion of peat into coal.

The whitish-green color of the *Sphagnums* is due to their peculiar structure. The stem is surrounded with a cylindrical sheath composed of large, loosely-arranged, chlorophyll-less cells, which have spiral or net-like thickenings in their walls. Similar cells also occur in the leaves, between the chlorophyll-bearing cells, as shown in Fig. 55. These large cells absorb large quantities of water by capillarity in the same way that a sponge absorbs water. Because of its high water-holding capacity, sphagnum moss is commonly used for packaging nursery stock for shipment to all parts of the world.

Help Us Write a Book On Flowers

The Editorial staff invite the readers of the Organic Gardening magazine to write an article on their favorite garden flower as petunia, aster, chrysanthemum, zinnia, delphinium, marigold, nasturtium, phlox, snapdragon, or other popular flowering plant. The article should be based upon observations and experiences of the writer, and, so far as possible, should be illustrated with glossy photographs. All articles contributed will be considered for publication in a new book on flowers. Those accepted will be paid for at the regular rates. Articles should be typewritten, double-spaced and on one side of paper only, and should include return postage for return if not accepted. Each article should be concerned with a particular kind of flower. Address your article to Managing Editor, Organic Gardening, Emmaus, Pennsylvania.

SAWDUST AND ROTTED WOOD

Fresh sawdust has been found a satisfactory seeding medium for primula and hybrid delphiniums, according to Professor MacAndrews of Syracuse University in *Delphinium*, 1945. Coarse green sawdust produces good drainage, moisture holding, and also prevents damping off. On a large scale, sawdust had best be used as litter in poultry house, rabbit hutch, and barn to absorb nitrogenous matter, especially liquid manure. This material can then be used as an excellent mulch or incorporated into the compost heap. Untreated sawdust is of acid reaction, even though it may contain as much as 25 per cent of its mineral content in form of calcium; when applied in composting, an extra sprinkling of lime must therefore be added, unless an acid compost is desired. Sawdust does not break down completely unless used in fine sprinklings; it should not be packed too heavily lest it prevent aeration of the heap. A practical method is to use 5-8% of the green matter in form of sawdust and to use excess sawdust for litter and subsequent mulching, especially with trees and acid-loving shrubs and berries. Since sawdust is more absorbent than most other materials except peat, it is very suitable for bedding in barns and saving liquid manure. Experiments at the Vermont Station were conducted by A. R. Midgley, who was able to show that sawdust can well be composted; it supplies energy food to bacteria and adds minerals to the compost. 10 per cent of the minerals in a hickory were found to be magnesia (according to Herbert Lunt of the Connecticut Experiment Station) and the potash content of the ash of ash trees was as high as 48 per cent. Such valuable fertilizers are most cheaply supplied by sawdust; care must only be taken that also enough nitrogenous matter is available, because growth food is as necessary for the bacteria as energy food.

The wood industries look for uses of sawdust. *Chemurgic Paper* 427 by A. R. Midgley of the Vermont Experiment Station in Burlington gives some interesting data. Fine pine sawdust held more water than any other material tested. A hundred pounds of bedding held 545 pounds of water. This means, of course, that valuable liquid manure is most easily saved whenever sawdust can be had in the barn. The common belief that sawdust is injurious to crops and soils was not borne out by the investigation provided that enough nitrogen was added with the sawdust. A ton of cow urine contained in the average 25 pounds of nitrogen. A cord of sawdust, selling for about $1.50 in Vermont, held 32 pounds of nitrogen and 39 pounds of potash. Based on commercial fertilizer prices, this meant a fertilizer saving of $6.36. But knowing the superior value of organic nitrogen and potash, we may add some more than that. It is true, sawdust decays more slowly than most other plant matter, but there seems to be no proof of any sort that it can hurt the soil.

SAWDUST MULCH

Tests made at the Oregon State College indicate sawdust is the best mulch material for blueberries, and it looks promising for use on strawberries and other small fruit crops.

Wood waste experiments have been under way at the college since 1943, using such products from the lumber industry as pine shavings, cedar-tow, redwood bark, spent tanbark and fir sawdust.

WILLOW SAWDUST

Q. If I can sell my compost for $3.00 per yard, is willow sawdust worth 75 cents per yard delivered on the pile?

A. Since your letterhead shows that your are the Manager of a Landscape Service, you will wish to supply your customers with a balanced compost. Willow sawdust is usually richer in minerals than the sawdust of other woods, since all plants growing in moist soils collect greater amounts of minerals than plants grown on dry soil. Willow sawdust also breaks down easily since there are no resins to coun-

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Healthy, Sturdy Plants

. . result when you use the richer, smoother moisture-retaining compost mixed by a KEMP POWER SOIL SHREDDER.

These sturdy machines, with unbreakable spring steel cutting teeth, mix soils, manure and compost 90% faster and more thoroughly with little effort. Pay for themselves in one season! Write now! Select the machine that suits your needs from the KEMP Catalog.

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teract or deter bacterial action. If therefore you can supply enough nitrogenous matter to get good heating and shrinkage, there is no reason why willow sawdust should not be used in greater amounts than softwood sawdust. I would, however, not use more than 8-10 per cent of the volume even of this material, so that you get a well balanced compost derived from different sources. The best way of testing your own product is by actually growing a few different plants in it to maturity. If upon mixing your compost with average garden soil your plants stay stunted and later develop yellow leaves, you will see that the material lacks nitrogen and perhaps other elements. In that case you can correct the product by recomposting it with some poultry or cow manure or some other nitrogenous material. On that basis a yard of willow sawdust might be worth 75 cents delivered.

SAWDUST IS STUBBORN

Sawdust varies according to the trees that have been sawed. Some woods have large cell cavities and thin walls, others have small cell cavities and thick cell walls, and others are between these extreme conditions. Some woods contain resins, alkaloids, and other organic substances. It is because woods are so different that it is a difficult matter to make a general statement. In most woods the cell walls are more or less highly lignified, and lignin decomposes rather slowly. It is for this reason that sawdust does not break down in the compost heap as readily as many other plant materials. In the compost heap, sawdust should not make more than about 5 per cent of the plant materials. If partly decomposed sawdust is used, the more it is decomposed the more of it can be used.

HOW TO USE MORE SAWDUST

If sawdust is mixed thoroughly with other green matter, such as weeds, leaves, etc. a little more can be used in the compost heap, say twenty to thirty percent.

Hardwood sawdust is preferable to that of soft wood.

BETTER COMPOST BETTER SOIL

Prettier Flowers; Superior Vegetables and Fruits

For The Joy of Organic Gardening

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Never Before A Product Like This!
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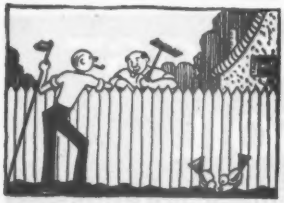

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Biologic Enzyme Process

BIORG

A Live 'Enzymic' Mycelium Yeast Colony

Affects plant cellulose and other material to facilitate **decomposed** compost for quick fertilizing availability.
Adds nitrogen to the "pile".
WORMS **thrive** on it because essentially BIORG is rich in minerals, vegetable protein and vitamins.

ONE OZ. will start the activation of an approximate 5x5x20 cu. ft. pile. The **live** cells in it grow and continue to grow as they feed and multiply on the carbohydrates and some cellulose material in the immature, unripened composts. You simply spray the pile with a solution of the BIORG. Then keep sprinkling it with water to keep it moist and allow yeast to multiply. Impregnation of a pile with BIORG will start a biologic process rolling and continue activity indefinitely except in very cold freezing weather. TRIAL SIZE (4 oz.) pkg., **fresh dated** $1.00 postpaid anywhere. Large users please request special bulk prices.

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CHERRY HILL IRIS GARDEN
Pleasantville, Penna.

Q. The soil we have here is heavy clay and dries quick and hard. Would it hurt my orchard or garden if I put ten or fifteen truck loads of shavings and sawdust to the acre on the land and plowed or disked it in?

I can get all the sawdust and shavings I want from a planing mill here and it looks to me like it would do the land good to use plenty of it.

A. No. It is better to compost it with other green matter and a little manure. To plow in quantities of raw matter would give the soil indigestion. If you do want to plow or disc it in, do not plant a crop there for a year or two until by examination you find that the material has thoroughly decayed. In plowing under such sawdust do not apply it more than two or three inches thick.

OAK SAWDUST

Q. Is oak sawdust good?

A. Yes, it can be used as any other sawdust. Be sure to apply sufficient ground limestone in the compost heap when sawdust is used.

OLD SAWDUST

Q. I have access to a pile of sawdust which has not been disturbed for years. The bottom of the pile is almost black and is caked somewhat. Has this any value in my family garden as a substitute for compost?

A. If it is thoroughly black it may be applied to the soil, with a little ground limestone. If it is only partly decayed, finish the process in the compost heap. Such sawdust can be used in larger quantities in the compost heap.

SAWDUST ON THE FARM

We know of cases where sawdust has been used on a large scale as a fertilizer on farms. Usually it is used as a litter with cattle so that it becomes impregnated with urine and manure, otherwise it would be a shock to the land the first year, but would build up the land for the second year's crops.

SAWDUST MULCH

One of the most common and perhaps the least used material that serves as a satisfactory mulch is saw-

(*Continued on Page* 55)

Books for Organic Gardeners

The Earth's Green Carpet

by Louise E. Howard

Lady Howard, widow of Sir Albert Howard, explains in this book her theory that degenerative diseases are on the increase all over the world as a result of the depletion of the soils by artificial chemical fertilizers. She stresses the fact that Man's health and happiness depend upon the use he makes of the *Earth's Green Carpet.* Cloth, 260 pp. **$3.00.**

•

The Earth's Face and Human Destiny

by Dr. Ehrenfried Pfeiffer

This book is a masterful evaluation of landscapes. A landscape, like a living organism can be healthy and beautiful only when it has the requisite environmental conditions for its biological functions. Man has been more destructive to the earth's face than almost any geologic agent, and he must be constructive in shaping his environment or it may become a barren wasteland. Cloth, 183 pp., 60 illus. Frontispiece in color. **$2.75.**

•

The Soil and Health

by Sir Albert Howard, C.I.E.

Food problems are soil problems and can be solved only by restoring to the soil its virginal fertility. Man has been and still is an exploiter, and most farmers are soil bandits. Sir Albert Howard saw clearly that mankind was poised on the verge of failure. He proved his theories, because he was not only a scientist but a practical farmer. Cloth, 320 pp. **$4.00.**

•

Bio-Dynamic Farming and Gardening

by Dr. Ehrenfried Pfeiffer

The author calls the attention of his readers to the more simple and natural methods of tilling the soil, planting, and harvesting. Comments are made on forestry, gardening, the dynamic activities of plant life, the relation of fertile soil to health, and results of bio-dynamic methods of farming based upon the return of all plant and animal residues to the soil. Cloth, 240 pp., 18 illus. **$2.50.**

•

The Compost Gardener

by F. C. King

An English gardener explains his system of organic gardening. This book has been imported to help make America health-conscious. Foreword by Sir Albert Howard. **$1.00.**

An Agricultural Testament

by Sir Albert Howard, C.I.E.

Sir Albert Howard was a genius, and AN AGRICULTURAL TESTAMENT is a work of genius. Used as a text-book, it will safely and surely bridge the gap for the novice between the use of harmful chemical fertilizers and organic methods, utilizing Nature's own laws and rhythms. Cloth. 253 pp. **$3.50.**

•

Grow a Garden

by Dr. Ehrenfried Pfeiffer

This book is an intimate, chatty discussion of the successful growing of a garden which insures self sufficiency. The author discusses size, and yield, digging and cultivation, watering and irrigation, the preparation of composts and fertilization, sprays and spraying, and hotbeds and coldframes. Paper, 118 pp. **$1.40.**

•

The Pruning Book

by Gustave L. Wittrock

This is definitely a book for the home gardener, an expert tree pruner always by your side. It deals masterfully with all kinds of shrubs and trees. The author shares his personal experiences with all. He tells his readers not only HOW to prune, but WHEN to prune. He deals with evergreens, hedges, brambles, ornamental trees and shrubs and fruit trees. Cloth, 166 pp. **$3.00.**

•

Trees and Toadstools

by M. C. Rayner, D.Sc.

This book deals with the most fundamental but little understood relationship between the lowly toadstools which grow in the forest floor and the giant trees which tower high over the other woodland plants. Most interesting of all is the symbiotic relationship between the toadstool mycelium and the roots of great trees, a partnership beneficial to both toadstool and tree. Cloth, 122 pp., 18 full-page illus. from photographs. **$2.50.**

•

Farmers of Forty Centuries

by F. H. King

Dr. King takes his readers into the fields of Japan and China to observe at first hand the agricultural practices which enabled those peoples to maintain their soils in a highly productive condition over a period of forty centuries. They convert all plant and animal residues into compost. Their soils show neither erosion nor signs of deficiencies in crop plants. Cloth, 384 pp., 209 illus. from photographs. **$5.00.**

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THE ORGANIC FARMER

A New Magazine by the Organic Gardening Organization

AT the request of thousands of farmers from all parts of the United States and Canada, the ORGANIC GARDENING ORGANIZATION has finally decided to establish a new *farm magazine,* to be called THE ORGANIC FARMER. This magazine will be devoted exclusively to all aspects of farming such as crop rotations, the reclamation of abandoned farms, soil management, soil building and fertilizer practices and other fundamental agricultural practices based on the *organic method.* THE ORGANIC FARMER will in no way duplicate the materials published in the ORGANIC GARDENING magazine. It will be concerned with the organic method as related to farms however small or large. Sufficient tests of the organic method on a farm scale have been made to prove that this method is not only practical but highly profitable. Cover crops as green matter and sheet composting enable the farmer to make compost on a farm scale without special equipment or additional labor. Each issue of THE ORGANIC FARMER will be filled with articles on the organic method on the farm, as well as the latest information on all aspects of farming. It will be issued monthly and contain 64 pages.

The first issue of THE ORGANIC FARMER will appear sometime in June or July of this year. The subscription rates will be $3.00 for one year, $5.00 for two years, and $6.00 for three years.

THE ORGANIC FARMER,
EMMAUS, PA.

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of your magazine.

. . . . . .

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dust. Who has not seen the large piles of sawdust by the wayside in many parts of the country? If sawdust is to be used for controlling weeds, it is better to use it in the fresh condition. Of course it must not be mixed with the soil but spread over the surface to a depth of from one to two inches. It is especially recommended for covering the drills of radishes, turnips, and other members of the mustard family a few days after the seeds have been sown, when only a very thin covering discourages the growth of annual weeds which can be most annoying when appearing among the young seedlings.

Sawdust mulches have been found to be highly beneficial to plums, pears, apples, peaches, vines of all kinds, currants, gooseberries, and strawberries. As a matter of fact, practically all herbaceous plants revel in a good sawdust mulch. Raspberries appear to respond less favorably to sawdust, but they do need a mulch of leaves or other plant material. Raspberries are shallow-rooted and should never be cultivated, but well mulched.

Sawdust mulches are valuable also for insulating the soil in winter against the alternate freezing and thawing which usually is injurious to plants that spend the winter in the soil. In the spring this mulch should be raked off and used in the compost heap. Or the weathered sawdust may be used for mulching the roses and other ornamental shrubs and trees. The longer sawdust mulch is used on a soil, the quicker it will be converted into compost as a result of the large population of lignin-decomposing soil organisms.

There are thousands of gardens in which it is impossible to make sufficient compost and here, I think, sawdust answers the problem, if intelligently handled. Raw sawdust is not a manure, nor can it be used as a substitute. Sawdust that has been weathered for a year—i.e., left in the open—is a magnificent mulch, and when it is sufficiently rotted the earthworms drag it down. This is what happens

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Rhododendron Maximum

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	25	100	1000
12 to 18 Inches	$5.00	$16.00	$125.00
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to decayed matter in the woodlands. One method of using raw sawdust to eke out the supply of manure is to make a large heap of earth, say 6 ft. by 4 ft. by 3 ft. high, and on top of this empty, for three or four months, all the bedroom slops. Then add the sawdust, putting first a layer of earth, then a thin layer (about 1 inch) of sawdust (it is no use putting the sawdust on thickly, for it would simply turn to a blotting-paper consistency and prevent the bacteria from working). Make one entire heap in this way and leave it for at least six months.

EUCALYPTUS SAWDUST

The wood of eucalyptus contains such small amounts of the oils which abound in other parts of the plant that eucalyptus sawdust can be used for mulching with little or no danger of injuring the soil organisms. It should not be worked into the soil until it is partly decomposed. Eucalyptus sawdust may also be used to make up from 10 to 15 per cent of the green matter in the compost heap.

WALNUT TREE SAWDUST

Walnut trees seem to have some kind of toxic effect on plants growing nearby, but if sawdust from such trees is used in moderation in compost making there would be no danger.

STRAWBERRY MULCH

Q. Is sawdust a satisfactory mulch for strawberry plants?

A. Sawdust can be used for mulching strawberries without danger of injuring the soil. It serves to control weeds, conserve soil moisture, and regulate the temperature of the soil by preventing it from heating up during the day time. One must be careful, however, not to cover the crowns of the plants. The soil should first be composted and then the sawdust added carefully between the plants.

ROTTED WOOD

Q. Are pieces of rotted wood usable as fertilizer?

A. No. It would be better to use them as mulch material in the vegetable garden or under trees.

TRACE ELEMENTS IN FOOD by G. W. Monier-Williams. (John Wiley & Sons, Inc., 440 Fourth Avenue, New York 16, New York. 1949. $6.00)

This is a timely and most valuable book for all interested in the growing of healthy plants as well as in the health of animals and man. Trace elements can be beneficial, innocuous, or harmful, depending on the quantity present in the soil and in the food. The author discusses fully the biochemistry, nutritional significance, and toxicology of the trace elements, and how far the presence of each trace element in food is due to its being an essential or occasional constituent of plants, or to the use of its compound in agricultural practice. Cloth bound, 511 pages. Replete with references.

BULBS FOR THE HOME GARDEN by John C. Wister. (Oxford University Press, 114 Fifth Avenue, New York 11, New York. 1948. $5.00)

This book is designed especially for the amateur gardener. It contains all the information that he will need on the many varieties of bulbs that can be grown successfully in this country with detailed cultural practices for each kind of plant. The contents include sources of supply, culture, bulbs especially adapted for the different kinds of gardens, as well as a full account of the history, species, varieties, and classification of all the most important kinds of bulbous plants. Cloth bound, 270 pages, extensive lists of varieties of daffodils and lilies, illustrated.

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